Variety and the impact of choice influencers in the diets of free-living adults

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ABSTRACT

Nursing homes, school lunch programs, institutional cafeterias, etc., provide limited food choices for meals, intending to offer satisfactory variety. But we are unaware of any research-based studies addressing the meaning of satisfactory variety within and across meals, days, weeks, and months. Our primary objective was to determine the variety of foods consumed by free-living, food-secure individuals. A secondary objective was to evaluate how overall food choice and the consumption of specific food classes were guided by several choice influencers. A third objective was to determine how the amount of variety consumed in the diet and how food choices guided by choice influencers affected satisfaction with variety.

Participants (50 male, 52 female; age at least 25 years with a Bachelor's degree) maintained a 28-day online food diary with seven eating occasions: breakfast, morning snack, lunch, afternoon snack, early evening snack, dinner, and late evening snack. After completing each week, participants rated their satisfaction with the variety in their diets that week and the impact of 13 choice influencers on the foods they consumed that week. We measured dietary variety as a count of unique foods and used these counts to calculate a proportion of unique foods consumed. We evaluated how dietary variety differed by gender, personality traits (food neophobia, sensation-seeking tendency, and boredom proneness), and eating occasions. The total number of foods consumed each week, the count of unique foods, and the proportion of unique foods were compared with satisfaction ratings. We determined key choice influencers by recording the frequency at which choice influencers were rated as having high, moderate, low, or no impact on selection over all foods consumed. We grouped each food consumed into one of 17 food classes to weigh the importance of the choice influencers for the consumption of specific food classes.

Participants consumed an average of 110 unique items over 28 days with higher counts of unique items for dinner (46 items), followed by lunch (38 items), and then breakfast (21 items). The highest proportions of unique items were consumed at dinner (0.60), early evening snack (0.59), lunch (0.56), and late evening snack (0.56). Female participants consumed higher counts of unique foods than did male participants over all eating occasions and for lunch, dinner, morning snack, afternoon snack, and total snack. Male participants consumed a higher proportion of unique foods for breakfast than female participant. Participants who were more food neophobic and those that had higher ratings of boredom proneness had lower counts of unique foods.

Liking, hunger, and convenience were most frequently selected as having a high impact on food choice. The 'presence on a menu,' 'only thing served,' and 'special occasion' were most frequently selected as having no impact on food choice. Liking was generally the highest rated choice influencer across food classes while the lowest rated choice influencer was typically 'because it was the only thing served.' Satisfaction with

variety was positively associated with liking while foods eaten because of convenience were associated with reduced satisfaction with variety.

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INTRODUCTION

It is a common conception that more is better, but is more also more satisfying? How does this apply to the amount of variety – or the amount of unique foods – in the diet? Nursing homes, school lunch programs, institutional cafeterias, etc., provide a limited assortment of food variety for meals, with the intent of offering a satisfactory amount of variety. However, we are unaware of any research-based studies addressing the meaning of satisfactory variety in individuals who are fully in charge of their food supply.

Variety can be both beneficial and detrimental. Variety in the diet is considered to be beneficial through providing most essential macro- and micro-nutrients (e.g. Krebs-Smith, Smiciklas-Wright, Guthrie, & Krebs-Smith, 1987). Additionally, in foodservice settings, more variety offered has been shown to increase customer satisfaction (Ko, 2009). On the other hand, variety can be considered detrimental as many have suggested that variety in the diet is partially to blame for the obesity epidemic (e.g. Raynor & Epstein, 2001). Others have found that too much variety can cause stress (Schwartz, 2005), preventing consumers from making decisions (Iyengar & Lepper, 2000). Regardless of the available research on variety, the impact of variety in the diet on satisfaction with variety remains relatively unexplored.

Liking has been found to be a primary motivator driving food choices, supporting the idea that people eat what they like (Phan & Chambers, 2016b). Other prominent motivators of food choice are hunger, habit, convenience, and cost (e.g. Renner,

Sproesser, Strohbach, & Schupp, 2012). Despite the extensive amount of research identifying the motivators of food choice, the effects of such motivators on consumer satisfaction with dietary variety are unstudied.

In this thesis, we evaluated the amount of dietary variety consumed by individuals in charge of their own food supply and the effect of that amount on their satisfaction with variety. We also observed how personality traits including food neophobia, sensation-seeking tendency, and boredom proneness affected the amount of dietary variety consumed. We determined how the consumption of specific classes of foods was driven by different motivators of food choice. Further, we demonstrated the effects of motivators of food choice on individuals' satisfaction with variety. These results will provide insight of the optimal amount of dietary variety in one's diet to promote their satisfaction with variety. These results will also advance the knowledge on how various motivators of food choice increase or decrease one's satisfaction with variety.

Chapter 1: Literature Review

1.1 Variety

1.1.1 Introduction to variety – definitions and related concepts

Variety can be defined in several ways: "the quality or state of having different forms or types," "a number or collection of different things especially of a particular class," or "something differing from others of the same general kind," to name a few (Merriam-Webster, Incorporated, n.d.). Perceived variety can be described as an individual's perception of the amount of variety available, as opposed to the true amount of variety present (Kahn & Wansink, 2004).

In terms of food, variety can be divided into three areas, as described by Meiselman, deGraaf, and Lesher (2000). First, within-meal variety is defined as the assortment of foods consumed in one eating occasion. Across-meal variety is the assortment of foods consumed at one eating occasion over several days or the assortment of foods consumed over all eating occasions in one day. Finally, dietary variety is the assortment of foods consumed over all eating occasions over an extended period of time (Meiselman et al., 2000).

Sensory-specific satiety is another related concept to variety, defined as a decrease in pleasantness of a food during consumption (B.J. Rolls, 1986; B.J. Rolls, Rolls, Rowe, & Sweeny, 1981). B.J. Rolls and colleagues (1981) showed that if one food was consumed in the first of two courses of a meal, liking would decrease for that food in the second course. Alternatively, if different foods were presented in the first and second courses, liking of the food provided in the second course would decrease less than if the

first and second courses contained the same food (B.J. Rolls et al., 1981). Remick, Polivy, and Pliner (2009) proposed that decreased sensory-specific satiety and increased liking can be achieved by providing individuals with a wide variety of foods, within or across eating occasions.

Psychologists Siegel and Pilgrim (1958) defined monotony in the diet – the absence of variety in the diet over time – and described how repetitive diets reduce the liking and consumption of foods. They studied if having repetitive meals led to rejection of foods by United States army men. The authors induced monotony by requiring participants to consume two repeated daily menus over 22 days. The participants were asked to rate their liking of the foods consumed following each meal. Uneaten food was weighed each day to measure changes in the amount consumed throughout the study period. The authors demonstrated that repeatedly-eaten foods had decreased liking ratings over the 22-day study period and that overall consumption of the foods also decreased throughout the study period. Similarly, Schutz and Pilgrim (1958) performed a study involving male employees at a U.S. Army hospital in an effort to observe how monotony reduced liking and consumption in "field" situations, as opposed to the cafeteria. The men received a set number of daily calories in the form of canned/fresh meats, vegetables, and fruits in addition to desserts and dry cereals. Four different daily menus were served throughout the study period. The men rated their liking of each of the provided foods partway and at the end of the study period. The amount of uneaten food was weighed daily to observe changes in consumption throughout the study. At the end

of the study period, the mean liking score over all provided foods decreased. Also, the overall amount of uneaten food increased throughout the study period.

More recently, Meiselman and colleagues (2000) evaluated how repeating individuals' midday meals could decrease their liking and consumption during a five-day work week. Participants were classified into a monotony group or a variety group. Those in the monotony group consumed the same midday meal Monday through Friday while those in the variety group consumed the same midday meal on Monday and Friday and different meals on Tuesday, Wednesday, and Thursday of the work week. Meatballs with brown gravy, mashed potatoes, and green beans were served daily to the monotony group and Monday and Friday to the variety group. Liking of the meal/meal components and the weight of uneaten food were measured daily following the conclusion of the meal. Significant decreases in liking ratings for the overall meal and for green beans were observed in the monotony group. In the variety group, no changes were observed in the liking ratings of those foods. The monotony group consumed significantly less weight in meatballs and green beans than did the variety group. The variety group consumed significantly more weight in meatballs, mashed potatoes, and green beans throughout the work week than did the monotony group. This study further confirmed that monotony in the diet can decrease liking and consumption over time.

1.1.2 Benefits and detriments of variety from a health perspective

In terms of health, it is widely understood that eating a variety of foods can provide one with a balanced diet. This concept is reinforced by the MyPlate guidelines published by the United States Department of Agriculture (USDA, n.d.), suggesting that

consuming a variety of foods allows individuals to consume the recommended amounts of macro- and micro-nutrients. This has been confirmed by several research groups (e.g. Hodgson, Hsu-Hage, & Wahlqvist, 1994; Krebs-Smith, Smiciklas-Wright, Guthrie, & Krebs-Smith, 1987; Smiciklas-Wright, Krebs-Smith, & Krebs-Smith, 1986). For example, Smiciklas-Wright and colleagues (1986) evaluated the effects of consumed variety on nutrient adequacy and macronutrient balance. The participants completed a one-day dietary recall and a two-day food diary. Variety was determined as a count of unique foods eaten in three days. Micro- and macro-nutrient adequacy of 11 nutrients was measured through adequacy ratios, calculated by dividing the participant's average nutrient intake by the associated recommended dietary allowance. For analysis purposes, the participants were grouped based upon their count of unique foods. The authors reported that as variety increased across groups, the adequacy ratios for most nutrients also increased, supporting that a varied diet promotes the consumption of necessary micro- and macro-nutrients (Smiciklas-Wright et al., 1986).

Alternatively, many researchers have suggested that consuming too much variety can lead to overeating, weight gain, and obesity. Raynor and Epstein (2001) reviewed publications regarding variety consumption and its relationship to obesity in humans. They concluded that humans consume more calories and larger amounts when provided with higher variety of foods within meals. The work of Remick and colleagues (2009) extended that of Raynor and Epstein (2001) to evaluate the "variety effect" – an increase in consumption due to increased variety present – both within and across meals. Remick and coworkers (2009) reviewed the literature with keywords – variety, food, eat(ing),

diet, sensory-specific satiety, monotony – to assess the variety effect. They concluded that in general, people will consume more both within and across meals when provided with a variety of foods (Remick et al., 2009) as detailed in several studies (e.g. B.J. Rolls, Van Duijvenvoorde and Rolls, 1984; B.J. Rolls et al., 1981a; Pliner, Polivy, Herman, and Zakalusny, 1980). This is particularly problematic in today's society, where people are confronted with high varieties of sweets and fatty foods, promoting over-consumption and increased body fatness (McCrory et al., 1999).

1.1.3 Benefits and detriments of variety from a marketing perspective

Berger, Draganska, and Simonson (2007) hypothesized a benefit of variety from a marketing perspective: more variety of similar items (e.g. different yogurt flavors) within a brand can increase the perceived quality of that brand. To evaluate this hypothesis, they recruited participants for a free chocolate tasting. Two boxes of chocolates were placed in front of each participant, one with 10 chocolates and the other with 30 chocolates. Participants were asked to select a chocolate from either of the boxes and rate the brand quality of each box of chocolates. The majority of participants selected a chocolate from the box with 30 options. The 30-option box was also rated as having higher brand quality (Berger et al., 2007). These results demonstrated that higher amounts of variety within an assortment of products was attractive to individuals and promoted the overall quality of the chocolate brand.

Additionally, many years of research have supported the idea that increased variety and number of choices in one's life can increase one's satisfaction (Sela, Berger, & Liu, 2009). For example, Hoch, Bradlow, and Wansink (1999) determined how

perceived variety promoted satisfaction. They introduced participants to the study, stating that stores have different assortments of products where some assortments are smaller and some are larger. The participants were told that they would be shown different assortments of "jinkos" – combinations of shapes, colors, and names – on a computer screen. After viewing an assortment of jinkos, the participants would rate how satisfied they were with the assortment, based upon how much variety was offered. The researchers showed that participants were more satisfied if they perceived a higher amount of variety in the assortment of jinkos. In retail environments, others have shown that increasing the amount of choice available to patrons increases their satisfaction. This is primarily because larger assortments of products increase the probability that patrons' preferred product(s) will be available (Baumol & Ide, 1956; Lancaster, 1990).

On the other hand, Iyengar & Lepper (2000) hypothesized that a more extensive amount of choice in life may be stressful and demotivating for consumers. The researchers evaluated the concept that increasing the amount of choice may be detrimental through three separate experiments. The purpose of the first experiment was to determine if the attraction to grocery store booths, the tasting of product samples, and the subsequent purchase of the products differed when shoppers were provided with a limited amount of choice or an extensive amount of choice. Shoppers at a grocery store had the choice to visit one of two booths: a limited-choice booth stocked with six jam samples or an extensive-choice booth stocked with 24 jam samples. The authors found that shoppers were initially more attracted to visit the extensive-choice booth. Yet the shoppers did not taste significantly more samples at the extensive-choice booth compared

to the limited-choice booth. Further, the shoppers who visited the limited-choice booth were more likely to purchase one of the jams they sampled than the shoppers who visited the extensive-choice booth (Iyengar & Lepper, 2000).

In their second experiment, Iyengar and Lepper (2000) determined if having a limited choice of essay topics (six topics) versus an extensive choice of essay topics (30 topics) affected students' motivation to complete an extra-credit essay assignment and predicted how well the students would perform in the assignment. They found that more students completed the assignment when they were provided with the limited choice of essay topics. Students also generally performed better when given the limited choice of essay topics.

In their third experiment, Iyengar and Lepper (2000) evaluated differences in choosing time, satisfaction, and purchase of chocolates after providing a limited choice or an extensive choice of chocolates. The participants were brought to a limited-choice display of six chocolates or an extensive-choice display of 30 chocolates and were asked to choose which chocolate they would most likely buy for themselves. They were timed to determine the length of the decision-making process. The participants completed a questionnaire before consuming their chosen chocolate, asking how satisfied they predicted they would be after consuming the chocolate and if the decision-making process was enjoyable, difficult, or frustrating. Following their choice, the participants consumed their chosen chocolate. They responded to questions regarding how satisfied they were with the consumed chocolate and how enjoyable it was. The study participants chose their compensation in the form of money or an equal-value box of chocolates.

Participants in the extensive-choice test group required more time than did participants in the limited-choice test group to complete their initial chocolate choice, reporting that making a decision was difficult and frustrating. Participants in the extensive-choice test group also reported that making the decision was an enjoyable experience. The limited-choice test group was overall more satisfied with the consumed chocolate in comparison to the extensive-choice test group. Those in the limited-choice test group were also significantly more likely to choose compensation in the form of a box of chocolates than those in the extensive-choice group. Overall, the three experiments demonstrated that having ability to choose from a variety of items led to greater interest and enjoyment, but having too much choice was debilitating and had negative effects on satisfaction and purchase potential.

Schwartz (2005) further described that having a multitude of choices in life can make people miserable. He provided several reasons as to how choice can be detrimental to peoples' lives. In a previous era, he noted that there were only two or three different types of jeans sold in stores. But at present day, he was overwhelmed by the amount of choice in jeans, differing by brand, style, wash, design, etc. He stated "all this choice made it possible for me to do better. But I feel worse," suggesting that the extensive amount of choice within an assortment can decrease satisfaction with the choices made.

1.1.4 Drivers of variety consumption

Gender

Many researchers have concluded that there is no difference between men and women in the extent of variety consumed. For instance, Smiciklas-Wright et al. (1986)

calculated the amount of variety consumed by 3,701 participants through a one-day dietary recall and a two-day food diary. They demonstrated through their three-day variety measurements that men and women consumed similar counts of unique foods.

Nicklaus, Boggio, Chabanet, and Issanchou (2005) studied the effects of gender on dietary variety in children. The two-part study period began with children two to three years of age at a self-serve daycare cafeteria. The food groups offered at the cafeteria included vegetables, starches, animal products, dairy products, and meals that combined one or more of the individual food groups. The percentages of unique foods consumed were calculated for each child by dividing the count of unique foods that were consumed by the count of unique foods offered and multiplying that ratio by 100. Percentages of unique foods consumed for each child were also calculated for every food group by dividing the count of unique foods within each food group consumed by the number of foods within each food group that were offered and multiplying that ratio by 100. No difference in variety consumption between female and male children was found. The same children (at that time ranging in age from 4 to 22 years) were contacted several years later for a follow-up. The follow-up participants were asked to complete a questionnaire regarding foods they had consumed within the past year. One hundred ninety-five foods (vegetables, starches, animal products, dairy products, combined foods) were listed in the follow-up questionnaire, 117 of which were served in the day-care cafeteria, 46 of which were commonly-consumed foods in that culture but not served in the day-care cafeteria, and 38 of which were considered unfamiliar items that were also not served in the day-care cafeteria. The adolescent variety score for each participant was

calculated by dividing the count of foods in the follow-up questionnaire that had been consumed within the past year by the total count of foods on the questionnaire and multiplying by 100. In the same fashion, the adolescent variety scores for each food group were calculated. The authors found that male adolescents consumed a higher variety of animal products than did female adolescents, but no difference between the genders at early ages was observed in the variety of animal products. Apart from the difference in consumption of animal products, male and female participants did not differ in the amount of variety consumed across or within other food groups, further suggesting minimal differences in variety by gender.

Gender differences in dietary variety have been observed in adult populations. Krondl, Lau, Yurkiw, and Coleman (1982) asked adults (66-77 years) to complete a food frequency questionnaire including 181 commonly-consumed foods. The participants reported which of the 181 foods they had consumed within the past year. The researchers found that women generally consumed more variety than men did (Krondl et al., 1982). Reid and Miles (1977) evaluated the variety consumed by Canadian adults aged 65 years or older. The participants of that study completed a four-day food record. Variety was measured as a count of unique foods consumed during the four-day study period. On average, participants consumed 89 unique foods. Male participants consumed significantly more variety than did female participants (Reid & Miles, 1977).

In summary, the literature provides varying conclusions on the presence of a difference in the variety consumed by men and women. If a difference between genders does exist, it is unclear if men or women consume more variety. It should be noted that

the summarized literature displays vastly different study populations and various data collection methods to complete the authors' objectives. Due to these differences in study goals, development, and analysis, it is impossible to directly compare these studies and suggest if gender influences the consumption of variety.

Age

Age has been suggested to increase the amount of variety consumed (e.g. Drewnowski, Ahlstrom Renderson, Driscoll, & Rolls, 1997; Krebs-Smith et al., 1987; Roberts, Hajduk, Howarth, Russell, & McCrory, 2005). For example, Roberts, Hajduk, Howarth, Russell, and McCrory (2005) used the 1994-1996 Continuing Survey of Food Intakes by Individuals to determine how the amount of variety consumed increased with age. Individuals in the survey completed two 24-hour recalls, separated by about 10 days. To complete their objective, Roberts and associates (2005) utilized the survey data for over 1,000 individuals. The individuals were sorted into one of two age groups: 21-60 years of age (young) and 61-90 years of age (old). The authors evaluated variety by counting the unique number of foods and caloric beverages consumed by the individuals in two days. On average, older individuals consumed about 18 unique foods in two days, which was significantly higher than younger individuals who consumed about 17 unique foods in two days.

Drewnowski and colleagues (1997) also examined the effects of age on the amount of variety consumed. Two age groups were studied in this research: 20 to 30 years of age and 60 to 75 years of age. Following a 24-hour recall and two full weeks of food records, the authors calculated the count of unique foods consumed by each

participant during the 15-day study period. The older male and female participants consumed average counts of unique foods of 68 and 70 foods, respectively. The younger male and female participants had significantly smaller counts of unique foods (56 and 64, respectively).

The studies completed by Roberts and associates (2005) as well as Drewnowski and associates (1997) are in contrast to several others, that suggest that older individuals consume less variety than younger individuals. For example, Fanelli and Stevenhagen (1985) studied food variety in older adults and how the amount of variety consumed changes with age. Three participant age groups were identified: 55-64 years of age, 65-74 years of age, and 75+ years of age. The data were collected using one 24-hour recall and a two-day food record. Variety was measured as the count of unique foods consumed over the recall and food records. On average, the 75+ age group consumed the lowest count of unique foods (33 for men and women) when compared to the 55-64 age group (37 for men and 35 for women) and 65-74 age group (36 for men and 35 for women).

Personality

A. Food neophobia

Food neophobia is defined as "a reluctance to eat and/or avoidance of novel foods" (Pliner & Hobden, 1992). Pliner and Hobden (1992) pioneered the measurement of food neophobia through the development of a 10-item food neophobia scale. Each item on the scale is a phrase that individuals rate their agreement with. Phrases to be rated included "I don't trust new foods," "I will eat almost anything," and "I like to try new ethnic restaurants," among others.

Food neophobia is a personality trait that has been shown to negatively affect the amount of variety consumed in the diet. Pliner and Hobden (1992) suggested that individuals who are more reluctant to consume new foods lack the drive for different sensations associated with a varied diet. This concept has been thoroughly studied (e.g. Pliner & Salvy, 2006), most often in children (e.g. Cooke & Wardle, 2007; Falciglia, Couch, Gribble, Pabst, & Frank, 2000; Pliner & Loewen, 1997). For example, Falciglia and colleagues (2000) evaluated how food neophobia in children related to the amount of consumed variety. The authors recruited fourth- and fifth-grade students who were deemed to be neophobic, non-neophobic, and average using the established food neophobia scale. Three-day dietary records were obtained via 24-hour recalls to determine a score for variety using the USDA Healthy Eating Index. The researchers determined that neophobic children had a significantly smaller variety score (6) than did non-neophobic children (10) or average children (10), suggesting that neophobia in children inhibits dietary variety.

Knaapila and associates (2011) studied the effects of food neophobia on variety consumed by an adult population. They recruited Finnish adult twins aged 20 to 25 and calculated each participant's food neophobia score. The participants completed a food questionnaire, rating the frequency of consumption of 46 foods ("never" to "several times a day"). Knaapila and colleagues (2011) found that the frequency of consumption of the 46 foods negatively correlated with food neophobia measurements, thus adults with higher food neophobia scores consumed less variety than those with lower food neophobia scores.

B. Sensation-seeking tendency

Sensation-seeking tendency is an indicator of the optimal stimulation level in one's life and one's desire for new experiences (Mehrabian & Russell, 1974; Zuckerman, 1979; Zuckerman, Kolin, Price, & Zoob, 1964). The level of optimal stimulation and thus sensation-seeking tendency varies from person to person (Lahteenmaki & Arvola, 2001). An individual's sensation-seeking tendency can be reflected in the amount of variety consumed in the diet. For example, individuals with higher sensation-seeking tendencies may consume more variety in their diets than would individuals with lower sensation-seeking tendencies. Zuckerman and colleagues (1964) developed a scale to measure sensation-seeking tendency. The 34-item scale was developed and each item consisted of two opposing phrases. Individuals would choose the phrase that best described them. One of the items was related to a person's likelihood of trying new foods. This item consisted of the phrases: "I order the dishes with which I am familiar, so as to avoid disappointment and unpleasantness" and "I like to try new foods that I have never tasted before." The researchers showed this item to be significant in the determination of sensation-seeking tendency for females, but not for males. In a later publication, Zuckerman (1994) further conveyed that people with higher sensation-seeking tendency scores would consume more novel foods than would individuals with lower sensation-seeking tendency scores. This is consistent with the findings of Mehrabian and Russell (1974) who also concluded that individuals with a higher desire for the unfamiliar, thus a higher sensation-seeking tendency, will consume a more varied diet to cope with their greater optimal level of stimulation.

In their development of the food neophobia scale, Pliner & Hobden (1992) referenced unpublished work describing an inverse relationship between food neophobia and sensation-seeking tendency (Pliner & Hobden, 1987). That work utilized the Experience Seeking sub-scale within the Sensation Seeking Scale published by Zuckerman (1979). Pliner and Hobden (1987) determined that a significant, negative correlation existed between participants' food neophobia scores and scores on the Experience Seeking sub-scale.

C. Boredom proneness

Boredom proneness is another personality trait expected to increase variety in the diet. Individuals who are more prone to boredom may consume more variety in an effort to curb or prevent their boredom, as boredom is one of the key characteristics contributing to variety-seeking tendency (van Trijp, 1995). Lahteenmaki and Arvola (2001) also suggested that a solution to growing bored with foods is variety. Zandstra, de Graaf, and van Trijp (2000) determined the effects of variety in the diet on boredom over a 10-week, in-home use test of three types of meat sauces. The participants were required to consume a meat sauce at least once per week. They were placed into one of the following treatment groups: monotony (consuming only one type of meat sauce during the study period), imposed variation (consuming all three types of meat sauces in a random order), and free choice (consuming the type(s) of meat sauces desired). Following each consumption of a meat sauce, the participants answered a question regarding boredom: "to what extent did you get bored with the flavor of the sauce?" The authors found that the participants in the monotony treatment group became the most

bored with the meat sauces while the participants in the free-choice treatment group were the least bored of the meat sauces throughout the 10-week study period. These results support that increased variety in the diet may provide a means to alleviate boredom.

Eating occasion

The amount of variety consumed in the diet is predicted to differ with the time of day, thus the eating occasion (Meiselman et al., 2000). Some research has been conducted on the variety consumed at eating occasions over time. For example, Khare and Inman (2006) hypothesized that breakfasts would include more repeated nutrients and foods than would lunch and dinner, perhaps due to habit or to reduce the amount of cognitive thought in the morning. To evaluate this point, they obtained results of an eating survey from a marketing firm in the United States. Those data were food diaries over a four-week period where participants reported their consumed foods at six eating occasions: morning snack, morning meal, afternoon snack, afternoon meal, evening snack, and evening meal. The data for the morning snack and meal were aggregated into a "breakfast" category, the afternoon snack and meal were aggregated into a "lunch" category, and the evening snack and meal were aggregated into a "dinner" category. The diary entries were coded by their content of six nutrients. The researchers found participants to consume a smaller variety of nutrients at breakfast when compared to lunch and dinner. They suggested that the participants consumed a smaller variety of nutrients at breakfast because a smaller variety of foods was consumed at breakfast. These results provided evidence that eating occasions can vary in the extent of food repetition and therefore the extent of dietary variety.

1.1.5 Satisfaction with variety

Dietary variety has been proposed to promote food satisfaction. Andersen and Hyldig (2015a) conducted focus groups to evaluate food satisfaction from a consumer's point of view. Many participants stated that a varied diet, within and across meals, along with varied sensory properties of foods were necessary for their satisfaction.

In another publication, Andersen and Hyldig (2015) identified how food complexity could influence food satisfaction. To accomplish this objective, they performed a consumer study to assess participant satisfaction following the consumption of soups. Participants attended two sessions and were provided with a different variation of creamy chicken soup at each session. While one soup was plain, another soup had additional chicken, croutons, parsley, and vegetables, differentiating it from the plain soup. The researchers discovered that participant satisfaction post-consumption was significantly lower for the plain soup than the soup with added chicken, croutons, parsley, and vegetables. The researchers concluded that satisfaction with a food could be increased by the complexity of the sensory attributes in that food.

Satisfaction in relation to variety has also been measured in institutional settings. Ko (2009) evaluated how the variety of foods available in an employee cafeteria contributed to satisfaction. The employees completed a questionnaire prompting for the impact of cafeteria food variety on their satisfaction. Ko (2009) concluded that having increased variety provided in the cafeteria increased the overall satisfaction of the employees.

1.2 Food choice

1.2.1 Introduction to food choice

Food choice is a complex process involving "the selection and consumption of foods and beverages, considering what, how, when, where and with whom people eat as well as other aspects of their food and eating behaviors" (Sobal, Bisogni, Devine, & Jastran, 2006). Many have studied the motivators of food choice, suggesting that liking (e.g. Rozin, 2007), habit (e.g. Young, 1949), hunger (e.g. Rozin, 2007), health (e.g. Furst, Connors, Bisogni, Sobal, & Falk, 1996), and other motivators (e.g. sociability, low cost) contribute to food choice. Köster (2009) proposed that motivations for food choice are driven by a combination of a person's qualities including biology, physiology, individual psychological traits, culture, economics, and others. Given the sheer complexity of food choice, an interdisciplinary approach has been recommended to elucidate the true motivations behind food choice (Köster, 2009).

The Eating Motivation Survey (Renner et al., 2012) is a recently-developed measurement to capture the diverse motivations prompting food choice. To establish the survey, Renner and colleagues (2012) enlisted the help of nutritionists and psychologists for interviews and discussion groups with individuals. They also compiled motivators from established eating motivation surveys to complete their comprehensive questionnaire assessing food choice. Over 1,000 participants completed an 87-item questionnaire asking them to rate the effect of specific motivations on their eating behaviors. Fifteen eating motivations were determined through this survey development: liking, habits, need and hunger, health, convenience, pleasure, traditional eating, natural

concerns, sociability, price, visual appeal, weight control, affect regulation, social norms, and social image, each defined by several statements (Renner et al., 2012). For example, liking was defined by the following statements: "…because I think it is delicious," "…because I have an appetite for it," "…because it tastes good," "…because I feel like eating it," and "…because I like it" (Renner et al., 2012).

1.2.2 Why do people choose to eat what they eat?

Liking

Liking is frequently regarded as one of the most important factors when evaluating why people choose to eat what they eat (e.g. Phan & Chambers, 2016b; Rozin, 2007). For example, Phan and Chambers (2016b) determined the most common motivations for the consumption of different food groups. To complete this objective, they recruited participants to report all foods consumed at their most recent eating occasion. Participants were also asked to provide the motivations driving the consumption of each food using a modified version of The Eating Motivation Survey (Renner et al., 2012). The foods consumed across participants were sorted into several different food groups. Liking was found to dominate the motivations for consuming each food group.

Habit

It has long been accepted that habit has great influence on peoples' food choices (Young, 1949). Using the established Eating Motivation Survey, Renner and associates (2012) determined that habit was a significant motivator of food choice. This was further evaluated by Phan and Chambers (2016b) in their analysis of motivators of food choice

for specific food groups. They found habit to be a primary motivator for their participants in the selections of breakfast cereals and certain beverages (water and tea).

Hunger

Rozin (2007) described that hunger is an obvious motivator of food choice, but hunger may not influence the choices of all foods. For example, in their evaluation of motivators for food choice of specific food groups, Phan and Chambers (2016b) determined that hunger was more of a primary influencer for cereals, dairy, eggs, and poultry than for other food groups. Hunger seemed to have less influence on the selections of beverages, indicating that individuals may select different foods depending on the hunger level.

Health

Health has been considered a main factor contributing to food choice by several researchers (e.g. Furst et al., 1996; Peters, Rappoport, Huff-Corzine, Nelsen, & Downey, 1995; Pollard, Steptoe, & Wardle, 1998; Steptoe, Pollard, & Wardle, 1995). Furst and colleagues (1996) conducted in-person interviews to determine key factors contributing to food choice in everyday life. They identified health as one of the primary influencers of food choice. Many participants remarked on the importance of health to avoid diet-induced diseases, to promote weight loss or weight control, and to enhance overall body health, providing evidence of the impact of health on peoples' food choice. For example, health was suggested to be a primary motivator for purchasing products (Furst et al., 1996). In fact, Dan Redfern of Ready Pac Foods Incorporated® remarked that consumers

are more focused on healthy food choices than they have been in the past (Grocery Manufacturers Association, 2017).

Cost

Cost can hold major or minor implications on food choice, depending on the financial situation of the individual and the eating occasion (Rozin, 2007). A study completed by Steptoe, Pollard, and Wardle (1995) determined the importance of motivators in food choice decisions. Cost was found to be one of the four most important influencers of food choice in their analysis. Further, the authors found the cost of foods to hold greater influence on the food choices of lower-income individuals as opposed to higher-income individuals.

Sociability

Renner and associates (2012) remarked that eating can be a "sociable" activity and as such, the social environment may dictate individuals' food choices. For instance, in the interviews conducted by Furst and colleagues (1996) to determine key motivations for individuals' everyday food choices, several participants suggested the importance of the social situation on food choice. One participant even remarked that they would eat a disliked food if it was served in someone's home, thereby demonstrating that individuals are more likely to consume what is available to them in social situations. Further, Phan & Chambers (2016b) identified that alcoholic beverages were commonly associated with sociability as a motivator for food choice while the choices of other beverages (e.g. low-calorie and nutritious beverages, tea, water) were not associated with sociability. These

results demonstrated that some foods are more likely than others to be selected because of sociability, indicating the importance of the social situation on food choice.

Time of day

Time of day has also been shown to be a strong motivator for food choice (e.g. Peters et al., 1995; Phan & Chambers, 2016a; Rappoport, Downey, & Huff-Corzine, 2001). Rappoport, Downey, and Huff-Corzine (2001) determined the motivations for food choices at morning, midday, and evening meals to evaluate how time of day influences food choices. The authors recruited participants who rated their most recent morning, midday, and evening meals on several motivations for consumption (e.g. liking, health, convenience, cost). Cost and convenience were more important motivators for morning meals than for evening meals. Motivations for food choice at the midday meal were largely similar to those of morning meals. Phan and Chambers (2016a) also reported varying motivations for food choice across meals where breakfast was more highly influenced by hunger and convenience while dinner was more highly influenced by sociability and the desire for variety. Taken together, these studies demonstrated the impact of time of day on food choice and how the selections of specific foods could be dictated by the time of day.

Convenience

It has been suggested that convenience is a primary motivator for peoples' food choices (e.g. Peters et al., 1995; Rozin, 2007; Steptoe, Pollard, & Wardle, 1995), as people often choose foods requiring minimal effort in selection and consumption. Painter, Wansink, and Hieggelke (2002) studied how convenience influenced participants'

consumption of chocolate. The participants experienced three different placements of chocolate in an office setting representing three levels of convenience: on top of the participant's desk (convenient and visible), in the participant's desk drawer (convenient and not visible), and on a shelf away from the participant's desk (inconvenient and not visible). The study lasted three work weeks and each chocolate placement lasted one work week. The researchers counted the number of chocolates consumed at the end of each work day for each chocolate placement. The participants consumed the highest number of chocolates when the chocolates were on the desk (convenient and visible) as compared to when the chocolates were in the desk drawer (convenient and not visible) or on the shelf (inconvenient and not visible), illustrating how convenience can impact food choice and consumption.

Only thing served

In a review, Mela (1999) stressed that if a food is unavailable to be chosen, it cannot be consumed. On the other hand, if a food is available or served to an individual, the odds of consumption are much higher, regardless of how much the food is liked (Mela, 1999). Redden and colleagues (2015) studied how serving vegetables first could increase the consumption of the vegetables. They evaluated this hypothesis through three experiments: a two-day elementary school cafeteria study, a five-day elementary school cafeteria study, and a laboratory study. In the two-day elementary school cafeteria study, the researchers organized one control day and one intervention day, separated by about three months to ensure the same meal was served both days. On the control day, students came into the cafeteria and sat down at a table, awaiting permission to stand in the lunch

line. In the lunch line, baby carrots were offered to the students as part of their lunches, but they were not required to take them. The researchers measured the weight of carrots consumed from the lunch line. On the intervention day, cups of carrots were served first at each of the tables for the students to consume while awaiting permission to stand in the lunch line. The students were not required or encouraged to eat them. Carrots were also offered in the lunch line as part of the students' lunches, but the students were not required to take them. The researchers determined the total weight of carrots consumed, the weight of carrots consumed that were served first at the table, and the weight of carrots consumed from the lunch line. They found that students consumed a higher total weight of carrots on the intervention day than on the control day, an increase of over 430%. The weight of the carrots obtained from the lunch line did not differ between the control and intervention days, therefore the increase in the weight of carrots consumed on the intervention days was due to the consumption of the carrots served first.

In the five-day elementary school cafeteria study, the researchers determined if serving a different vegetable first and changing the presentation style of that vegetable would still increase consumption. They organized five testing days: two control days separated by three intervention days. Two to three weeks passed between the testing days. On the control days, the students were offered broccoli as part of the students' lunches, but the students were not required to take any. The amount of consumed broccoli by weight was determined. On the intervention days, the students were served broccoli first and were handed small portions of broccoli while waiting in the lunch line. They were also offered broccoli in the lunch line as part of their lunches, but they were not

required to take any. The researchers determined the total weight of broccoli consumed, the weight of broccoli consumed that was served first, and the weight of broccoli consumed from the lunch line. The total weight of broccoli consumed on the intervention days was higher than on the control days. Although the students did not eat much of the broccoli that was served first, this consumed broccoli accounted for the majority of the total broccoli consumption on the intervention days.

In their third study, Redden and associates (2015) tested if adults would consume more of a less-liked snack (baby carrots) or more of a more-liked snack (M&Ms) if the snacks were served simultaneously or if one snack was served before the other. The participants of this study were presented with 50g of each snack in one of three serving arrangements: baby carrots and M&Ms served simultaneously, baby carrots served five minutes before M&Ms, or M&Ms served five minutes before baby carrots. The participants were told they could eat as desired while watching two, five-minute videos. The amount of each snack consumed was calculated following the completion of the videos. The researchers found that participants consumed more of the snack if was served first compared to served second or simultaneously. These conclusions were regardless of if the snack was less liked (baby carrots) or more liked (M&Ms).

Elsbernd and associates (2016) also examined how serving colored bell peppers to elementary school students first while waiting in the lunch line impacted their consumption of vegetables during the school lunch. They organized two control days where no bell peppers were served first while the students were waiting in the lunch line, separated by three intervention days where bell peppers were served first while the

students were waiting in the lunch line. On the intervention days, students were encouraged to take the bell peppers in line, but they were not required to. Additional bell peppers were also offered as part of the students' lunches, but the students were not required to take any. More bell pepper by weight was consumed on the intervention days than on days when the bell peppers were not served first. Further, the average number of students taking bell peppers while waiting in line or as part of the school lunch increased by 669% from the two control days to the three intervention days. Taken together, the results of these several studies demonstrated how foods being the only thing served, or served first, could promote the choice and subsequent consumption of those foods.

Presence on a menu

The availability of foods on a menu strongly influences food choices and the formation of individuals' diets (Furst et al., 1996). In line with 'the only thing served,' the consumption of foods is highly dictated by the availability of those foods at that point in time (Mela, 1999).

Preferences of others

In-person interviews conducted by Furst and colleagues (1996) revealed individuals' willingness to adapt to the preferences of others when making food choices. In many instances, people select foods to accommodate the dietary restrictions of a loved one. A participant stated in regards to her husband: "I'll do what he enjoys and I'll do what I enjoy… [but]… what's important to me, is making him happy" (Furst et. al., 1996), indicating the importance of maintaining relationships by upholding the food preferences of loved ones.

Mood improvement

Foods are frequently consumed to modulate one's mood (for review see Rogers, 1996). To assess this concept, Lyman (1982) determined the preferred foods of individuals at different moods. He recruited participants to dictate their food preferences when experiencing one of 22 different moods (e.g. amusement, fear, joy, love, sadness). The participants were asked to be specific in what foods they preferred in different moods. Food preferences were categorized by nutritional value (healthful, junk, a combination of healthful and junk foods) and by food group (dairy products, proteins (e.g. meats, eggs), fruits and vegetables, cereals and grains, alcohol, other). In most moods including sadness, participants preferred healthy foods significantly more than junk foods. The preference for junk foods was not significantly higher than the preference for healthy foods in any mood. In a happy mood, participants most frequently described their preference for meats and fruits and vegetables. In sad or depressed moods, participants most frequently preferred foods in the 'other' category but fruits and vegetables were often preferred by participants in these moods. Overall, Lyman (1982) found that participants favored different types of foods depending on their mood, suggesting that certain foods may be preferred for mood improvement.

Others have shown mood improvement to have limited effect on food choice. In the development of The Eating Motivations Survey, phrases were included that contributed to "affect regulation," or the act of modulating one's mood. Phrases such as "…because I am sad," "…because I am frustrated," "…because I feel lonely," and "…because it cheers me up" described affect regulation in the survey (Renner et al.,

2012). The researchers found that food choices were rarely motivated by affect regulation. Phan and Chambers (2016b) also showed that participants seldom selected foods for affect regulation.

Special occasion

The selections of foods on a typical day differ greatly from the selections of foods at special occasions (Rozin, 2007). Following many in-person interviews with individuals in a grocery store environment, Furst and colleagues (1996) concluded that individuals consume a different assortment of foods given the occasion. For example, "holiday traditions, special occasion meals, or ritual observances involving foods called for particular foods, for example 'cakes for birthdays'" (Furst et al., 1996). One interviewee remarked that foods provided at special occasions are treats unusual to the typical day. Another described that during occasions such as holidays, they choose foods for enjoyment and to indulge. As such, food choices may be influenced by the occasion, be it a typical day or a special occasion such as a holiday or even a birthday party.

1.2.3 The impact of food choice on satisfaction with variety

There are many aspects of food choice that build individuals' satisfaction with the amount of variety they consume. In focus group interviews described by Andersen and Hyldig (2015a), participants were asked questions regarding what contributes to their overall satisfaction with the foods they consume. Several of those interviewed suggested that different sensory attributes such as flavor, taste, appearance, and texture promote their satisfaction with food. Others remarked the importance of hunger on their satisfaction. For example, participants stated that they would not be satisfied if they were

still hungry after eating. The context of the eating occasion, specifically the location, time of day, and presence of others, also influenced the participants' satisfaction with food. To describe the importance of time of day on satisfaction, one participant said "at lunch I eat to get full, but otherwise I eat to taste," implying that satisfaction may be achieved in different ways depending on the time of day and eating occasion. Social aspects were another factor that added to participants' satisfaction with food. Another participant suggested that social eating, as opposed to eating alone, makes the food taste better. Some stressed that eating unhealthy foods would not be as satisfying as eating healthy foods while others found unhealthy foods to be more satisfying than healthy foods. As described, there exist a multitude of factors within the psychological complexity of food choice that can contribute to satisfaction with the amount of variety consumed.

Chapter 2: Objectives and Hypotheses

Objective A: To determine the amount of variety consumed by free-living, food-secure individuals who made the decisions about what they consumed

Hypothesis A1: Participants would consume the largest amount of variety across dinner occasions.

Hypothesis A2: Participants would consume the least amount of variety across breakfast occasions.

Hypothesis A3: Female and male participants would consume a similar amount of dietary variety over 28 days.

Objective B: To weigh the importance of personality attributes (food neophobia, sensation-seeking tendency, and boredom proneness) on the amount of dietary variety consumed

Hypothesis B1: Participants who were more food neophobic would consume less dietary variety than those who were less food neophobic.

Hypothesis B2: Participants who demonstrated more sensation-seeking tendency would consume more dietary variety than those who demonstrated less sensation-seeking tendency.

Hypothesis B3: Participants who were more prone to boredom would consume more dietary variety than those who were less prone to boredom.

Objective C: To demonstrate the effects of weekly variety on ratings of satisfaction with weekly variety

Hypothesis C1: Participants who consumed higher weekly variety would report higher weekly ratings of satisfaction with weekly variety.

Objective D: To evaluate how the consumption of specific food classes was guided by specific choice influencers

Hypothesis D1: Choice influencer ratings would have varied importance on different food classes.

Objective E: To demonstrate the effects of choice influencers on ratings of satisfaction with weekly variety

Hypothesis E1: Making food choices because of liking would positively impact satisfaction with weekly variety.

Hypothesis E2: Making food choices because of hunger would positively impact satisfaction with weekly variety.

Hypothesis E3: Making food choices because of sociability would positively impact satisfaction with weekly variety.

Chapter 3: Methods – Data Collection

3.1 Participants

Prior to recruitment, we received approval for this study from the Institutional Review Board at the University of Minnesota. We recruited 102 participants (52 female, 50 male) by word of mouth, with flyers posted on the University of Minnesota campus (**Appendix A**), and via email to a list of potential participants organized by the University of Minnesota Sensory Center (**Appendix B**). Potential participants were required to complete an online screener (Qualtrics®; Provo, Utah) with questions soliciting information on food allergies and sensitivities, food security, extent and frequency of purchasing and preparing food, and educational background (**Appendix C**). Individuals also provided information on their culinary background by answering the following questions:

1. What country do you consider to be your "culinary home"? (By culinary home we are referring broadly to food choices and cooking methods).
2. What type (cuisine, nationality, region, etc.) of food do you primarily eat at home?
3. In what country did you live during the majority of years between the ages of 5 and 18?

Participants were eligible to take part if they were 25 years of age or older, had a Bachelor's degree or higher, and were free living (the primary decision makers for the purchase and preparation of the foods they consume). Eligible participants were also food secure (Bickel, Nord, Price, Hamilton, & Cook, 2000). A maximum of one person per household was permitted to participate. Participants were selected based upon their culinary backgrounds where qualified participants considered their culinary home to be

from one of the following geographical areas: United States of America, Russia, Japan, or Europe. Suitable participants also consumed foods (cuisine, nationality, or region) similar to those consumed in the selected geographical areas.

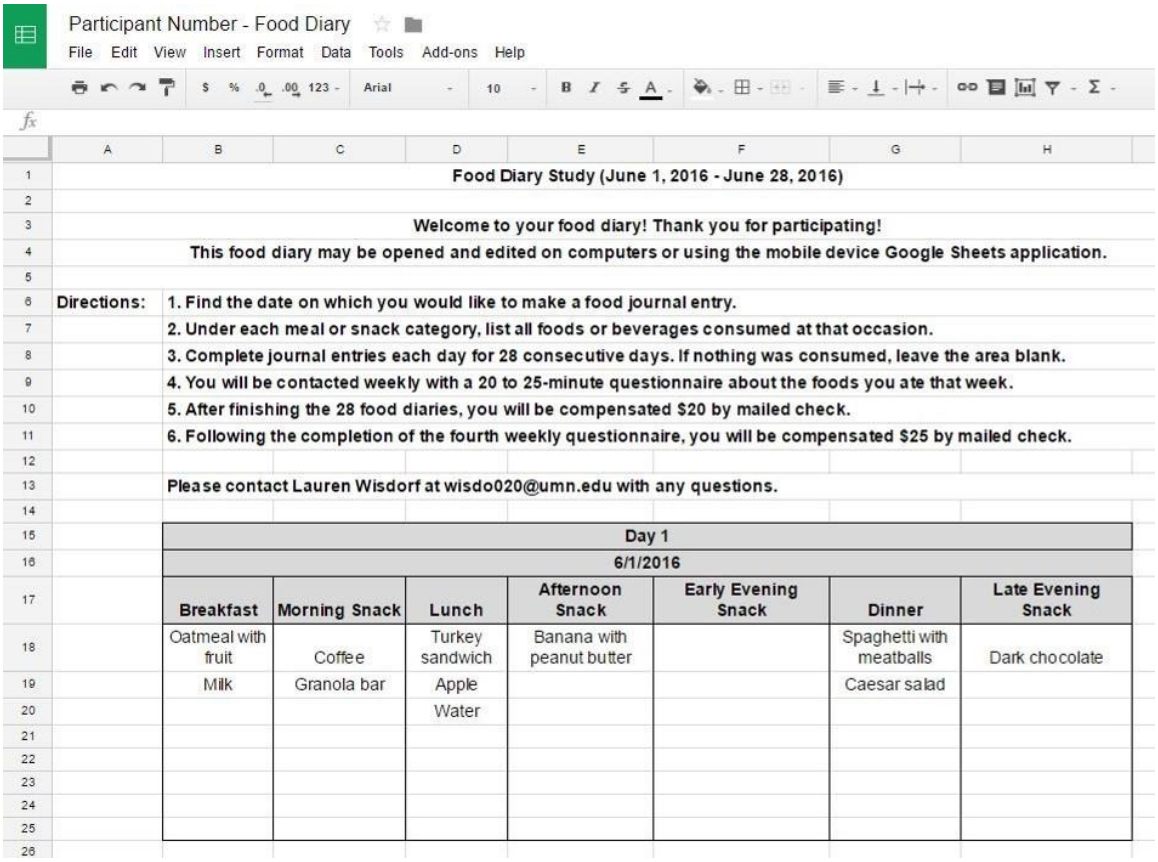
We deemed potential participants ineligible if they did not meet the age or educational background qualifications, were not free living, or were not food secure (Bickel et al., 2000). Potential participants were also excluded if their culinary homes and typical cuisines consumed did not originate from the desired geographical areas.

3.2 Introductory session

Eligible participants were required to attend one 15-20 minute introductory session with the study coordinator (LW) in person via Skype® video chat, or via phone call (for script see **Appendix D**). Participants read and verbally agreed to the consent form (**Appendix E**) and understood the payment distribution information. Participants would be compensated in three allotments for a total of $50. A first payment ($5) was distributed following the in-person introductory session; a second payment ($20) was distributed at the completion of the 28-day food diary; a third payment ($25) was distributed at the completion of the final weekly questionnaire. If participants attended an introductory session via Skype or phone call, their initial $5 payment was added to the subsequent payment. Those participants received a total of two payments. We provided participants with a reminder slip that provided examples of diary entries and contact information for the study coordinator (**Appendix F**).

During the introductory session, participants were introduced to the online food diary platform using Google Drive™ (**Figure 3.1**). We also instructed participants to

complete a personality questionnaire to determine their scores for food neophobia (Pliner & Hobden, 1992), sensation-seeking tendency (Mehrabian & Russell, 1974), and boredom proneness (Farmer & Sundberg, 1986) (**Appendix G**).



Participant Number - Food Diary

File Edit View Insert Format Data Tools Add-ons Help

Food Diary Study (June 1, 2016 - June 28, 2016)

Welcome to your food diary! Thank you for participating!

This food diary may be opened and edited on computers or using the mobile device Google Sheets application.

Directions:	**1. Find the date on which you would like to make a food journal entry.**
	2. Under each meal or snack category, list all foods or beverages consumed at that occasion.
	3. Complete journal entries each day for 28 consecutive days. If nothing was consumed, leave the area blank.
	4. You will be contacted weekly with a 20 to 25-minute questionnaire about the foods you ate that week.
	5. After finishing the 28 food diaries, you will be compensated $20 by mailed check.
	6. Following the completion of the fourth weekly questionnaire, you will be compensated $25 by mailed check.

Please contact Lauren Wisdorf at wisdo020@umn.edu with any questions.

Day 1						
6/1/2016						
Breakfast	**Morning Snack**	**Lunch**	**Afternoon Snack**	**Early Evening Snack**	**Dinner**	**Late Evening Snack**
Oatmeal with fruit	Coffee	Turkey sandwich	Banana with peanut butter		Spaghetti with meatballs	Dark chocolate
Milk	Granola bar	Apple			Caesar salad	
		Water				

Figure 3.1: Sample food diary using the online Google Drive platform.

3.3 Data acquisition

Participants completed their 28-day food diaries using a Google Drive Sheet, accessible only by one participant, the study coordinator, and the study supervisor (ZV). We requested the participants to make entries with food names (no amounts required) that were meaningfully distinguishable to them as illustrated by the following examples:

> • If you consume pizza on a regular basis and always consume the same brand and kind of pizza, you may name this food "pizza." If you go to a restaurant and get a type of pizza that is different to you from your usual, you may name this food differently (e.g. "Pizza Hut pizza," "deep-dish pizza").
> • If you consume coffee with cream on a regular basis, you may name this food "coffee." If you occasionally add sugar to your coffee with cream, making this food different from your usual, you may name this food differently (e.g. "coffee with sugar").

We provided seven eating occasions for each day: breakfast, morning snack, lunch, afternoon snack, early evening snack, dinner, and late evening snack. The study coordinator sent a nightly reminder by email to all active participants.

After completing each week of the food diary, participants received a questionnaire. The participants were first asked to rate their satisfaction with the variety in their diets during the previous week using a seven-point scale (1: completely dissatisfied; 7: completely satisfied) (**Appendix H**). Participants were also asked to rate the impact of motivators for food choice, termed 'choice influencers,' for each food consumed that week (**Appendix H**). Each food name was included in the weekly questionnaire once despite the number of times it had been eaten during the week. We used a modified Eating Motivation Survey (Renner et al., 2012) to evaluate participants' food choices through the rated choice influencers. Choice influencers included the following: liking, convenience/preparation time, habit, time of day, hunger, preferences of others, health or nutrition, low cost, presence on a restaurant/take-our menu, special occasion (e.g. birthday, holiday), sociability, to improve my mood, and because it was the only thing served. All choice influencers were rated on a four-point scale (1: no impact

on selection; 2: low impact on selection; 3: moderate impact on selection; 4: high impact on selection).

Chapter 4: Methods – Data Analysis

4.1 Data cleaning

Two participants were omitted from all analyses utilizing ratings of satisfaction with weekly variety and choice influencer impact ratings from the weekly questionnaires. They were not omitted from analyses solely using data on the amount of dietary variety consumed. One omitted participant indicated the same level of satisfaction with weekly variety each week in addition to rating each choice influencer as having moderate impact on all foods consumed throughout the study period. The second omitted participant did not complete all four weekly questionnaires.

If a participant completed the weekly questionnaire more than one time, only their most recent responses were included in data analysis. If the most recent responses were incomplete, we filled the missing ratings in using the participants' second most recent responses. Three participants repeated the questionnaire for one week and another participant repeated the questionnaires for two weeks. If participants failed to rate a choice influencer for a food, we assumed that the choice influencer had no impact on the consumption of that specific food and coded these non-responses as 1 (no impact on selection).

4.2 Measuring the dietary variety of foods consumed

4.2.1 Measuring dietary variety as a count and a proportion of unique foods

We counted the total number of foods consumed by each participant (n = 102) over all eating occasions and for each eating occasion. We also counted all foods consumed over all snack occasions, referred to as total snack. We determined a

cumulative count of unique foods across participants from the first week of the study period to the fourth week of the study period. The cumulative count of unique foods for week one was the count of unique foods consumed during the first week. The cumulative count of unique foods for two weeks was the count of unique foods consumed during the first and second weeks. The cumulative count of unique foods for three weeks was the count of unique foods consumed during the first, second, and third weeks. The cumulative count of unique foods for four weeks was the count of unique foods consumed during the first, second, third, and fourth weeks. A food that was consumed in two or more weeks of the study period was counted as one unique food in determining the cumulative count of unique foods. We also determined the count of unique foods consumed by each of the participants for each week, over all eating occasions, for each eating occasion, and for total snack. One food was considered different from another food if the name provided by the participant was different after some editing for spelling (e.g. pizza and pepperoni pizza were considered as different foods; Cheerios® and Honey Nut Cheerios® were considered as different foods; vanilla yogurt and strawberry yogurt were considered as different foods; iced tea and hot tea were considered as different foods).

We determined the proportion of unique foods for each participant over all eating occasions, for each eating occasion, and for total snack by taking the ratio of the count of unique foods consumed to the total number of foods consumed (**Equation 3.1**). For example, if Participant X consumed 300 total foods in 28 days, but 90 unique foods, their proportion of unique foods over all eating occasions would be 0.3. Additionally, if

Participant X consumed 40 total foods for breakfast, but only 12 unique foods, their proportion of unique foods for breakfast would also be 0.3.

Equation 3.1: Calculation of the proportion of unique foods.

$$Proportion\ of\ unique\ foods = \frac{Count\ of\ unique\ foods}{Total\ number\ of\ foods}$$

Using R®, we determined if the total number of foods and the count of unique foods differed with age by performing simple linear regression using participants' total numbers of foods and counts of unique foods as the dependent variables and participant age as the independent variable. We also determined if the proportion of unique foods differed with age by performing logistic regression using participants' proportions of unique foods as the dependent variable and participant age as the independent variable. We evaluated how the total numbers of foods, the counts of unique foods, and the proportions of unique foods differed across eating occasions by taking the average total number of foods, the average count of unique foods, and the average proportion of unique foods over all eating occasions, for each eating occasion, and for total snack across participants. The average daily counts of unique foods across participants were also calculated over all eating occasions and for breakfast, lunch, and dinner. We evaluated differences between male and female participants in the total numbers of foods, the counts of unique foods, and the proportions of unique foods over all eating occasions, for each eating occasion, and for total snack by taking the average total number of unique foods, the average count of unique foods, and the average proportion of unique foods by gender. The average daily counts of unique foods by gender were also calculated over all eating occasions and for breakfast, lunch, and dinner. We performed t-tests to determine

statistically-significant ($p < 0.05$) differences between male and female participants in the average total numbers of foods, counts of unique foods, proportions of unique foods, and daily counts of unique foods. See **Appendix I** for R code.

4.2.2 Determining the impact of personality traits on dietary variety

Scores for food neophobia were tallied in accordance with Pliner and Hobden (1992). Sensation-seeking tendency scores were calculated as described by Mehrabian and Russell (1974). Scores for boredom proneness were measured in agreement with Farmer and Sundberg (1986). We determined if ratings of food neophobia, sensation-seeking tendency, or boredom proneness were predictors of the total number of foods consumed or the count of unique foods through simple linear regression in R. We also determined if ratings of food neophobia, sensation-seeking tendency, or boredom proneness were predictors of the proportion of unique foods through logistic regression. See **Appendix I** for R code.

4.2.3 Determining the impact of variety on satisfaction with weekly variety

Using R, we fit linear mixed-effects models with repeated measures using participants' ratings of satisfaction with weekly variety as the dependent variable and participants' weekly total numbers of foods, weekly counts of unique foods, and weekly proportions of unique foods as the independent variables to determine how satisfaction with weekly variety was impacted by the amount of variety consumed (**Appendix I**).

4.3 Measuring the impact of choice influencers on food choice

4.3.1 Determining the importance of each choice influencer on food choice

The frequency that each choice influencer had high impact on selection, moderate impact on selection, low impact on selection, and no impact on selection was determined to ascertain the importance of each choice influencer on food choice over all foods consumed across all participants.

4.3.2 Determining the importance of each choice influencer on the consumption of specific food classes

Participants' foods were grouped into food classes adapted from University of Minnesota Nutrition Coordinating Center Food Grouping (Duong, 2017) and from Haws, Liu, Redden, and Silver (2016). The participants' individual foods were sorted into one of the following food classes (* indicates classes excluded from analysis) (see **Appendix J** for further details on food class inclusions):

- Alcohol (i.e. alcoholic beverages)
- Beverages (i.e. beverages not part of alcohol, dairy, fruits, non-dairy, vegetables, or water classes)
- Candy (i.e. candy, sugar, sweets)
- Dairy (i.e. milk, cheese, related dairy products)
- Desserts (i.e. cakes, pies)
- Eggs (i.e. eggs, related egg products)
- Entrees (i.e. commercial entrees, dinners)
- Fats (i.e. fats, oils, nuts)
- Fruits (i.e. fruits, fruit products, fruit juices)
- Grains (i.e. grains, grain products)
- Meats (i.e. meat, fish, poultry)
- Miscellaneous (i.e. condiments, dips, sauces)
- Non-dairy* (i.e. imitation milk, cream, related non-dairy products)
- Soups (i.e. soups, gravies)
- Supplements* (i.e. supplements, drugs)
- Vegetables (i.e. vegetables, vegetable products, vegetable juices)
- Water

Each food was placed into a single class. The entrees class included multi-component foods (e.g. spaghetti and meatballs, pizza, sandwich). The beverages class included beverages that were not included in the alcohol, dairy, fruits, non-dairy, vegetables, or water classes.

Two classes – supplements and non-dairy – were omitted from data analysis by food class. The supplements class was not applicable to this study. The non-dairy class was omitted due to the low frequency of participant consumption of foods within this class.

For each food class, we measured the frequency with which each choice influencer had high impact on selection, moderate impact on selection, low impact on selection, and no impact on selection.

4.3.3 Determining associations between choice influencers and specific food classes

We performed a three-way parallel factor analysis (Parafac) (Harshman, 1970) in R. The Parafac model was chosen as an extension of principal components analysis to assess data variation by three modes: food classes, choice influencers, and participants. We imposed an orthogonal constraint on the choice influencers. We determined the best number of components to use for this analysis to be that which accounted for the most covariation in the data. Within each component, each food class and each choice influencer had a loading centered about the origin. Meaningful food classes and choice influencers within a component were defined as those whose loadings were greater than or equal to the absolute value of 0.5. See **Appendix I** for R code.

4.3.4 Determining the impact of choice influencers on satisfaction with weekly variety

For each participant, we averaged the weekly impact ratings for each choice influencer over all foods consumed that week. To determine the key choice influencers responsible for satisfaction with weekly variety, we fit linear mixed-effects models with repeated measures using participants' ratings of satisfaction with weekly variety (dependent variable) and the average weekly impact rating for each choice influencer for each participant (independent variables) (**Appendix I**).

Chapter 5: Results

5.1 Measuring the dietary variety of foods consumed

5.1.1 Measuring dietary variety as a count and a proportion of unique foods

Participants consumed between 72 and 548 total foods over the 28-day study period (**Figure 5.1**). During the first week of the study period, participants consumed counts of unique foods between 15 and 88 (**Figure 5.2**). Throughout the study period, they consumed counts of unique foods ranging from 29 to 211 foods (**Figure 5.3**) and proportions of unique foods ranging from 0.1 to 0.7 (**Figure 5.4**).

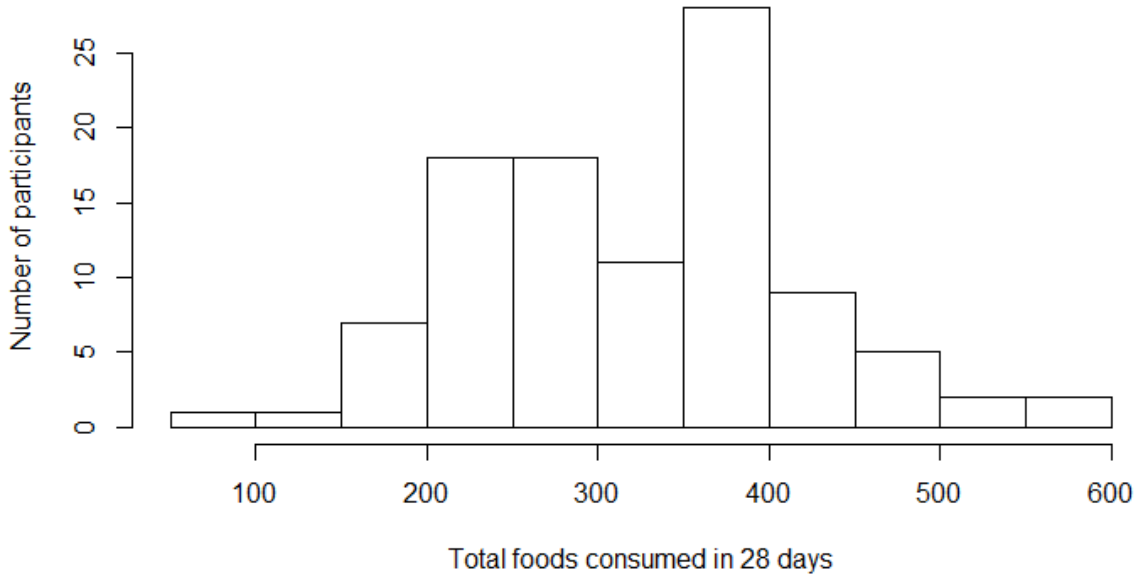


Figure 5.1: Distribution of the total number of foods consumed across participants (n = 102) over 28 days.

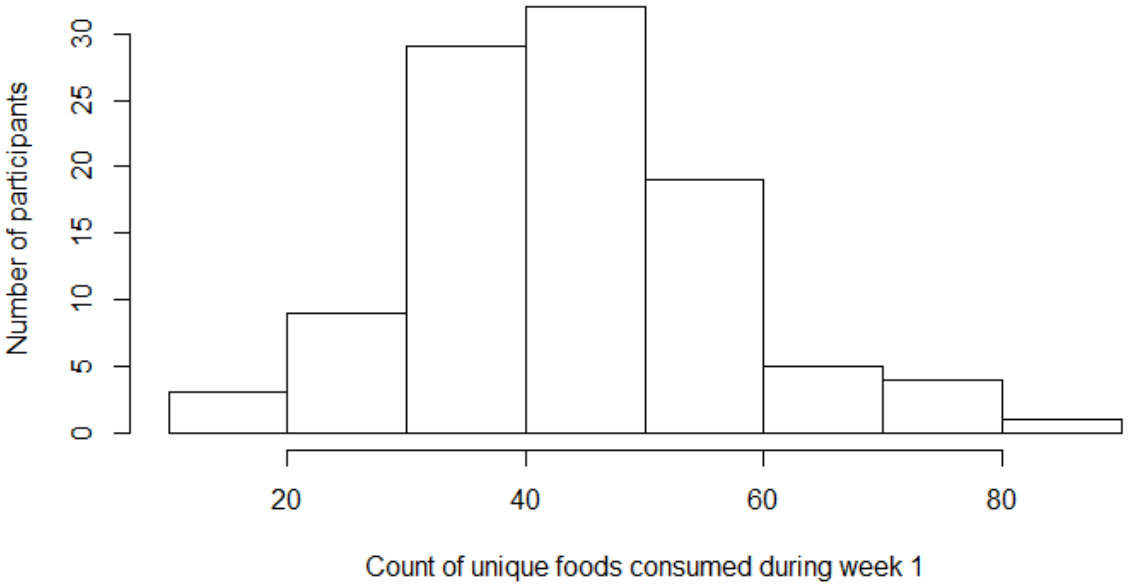


Figure 5.2: Distribution of the count of unique foods across participants (n = 102) during week 1.

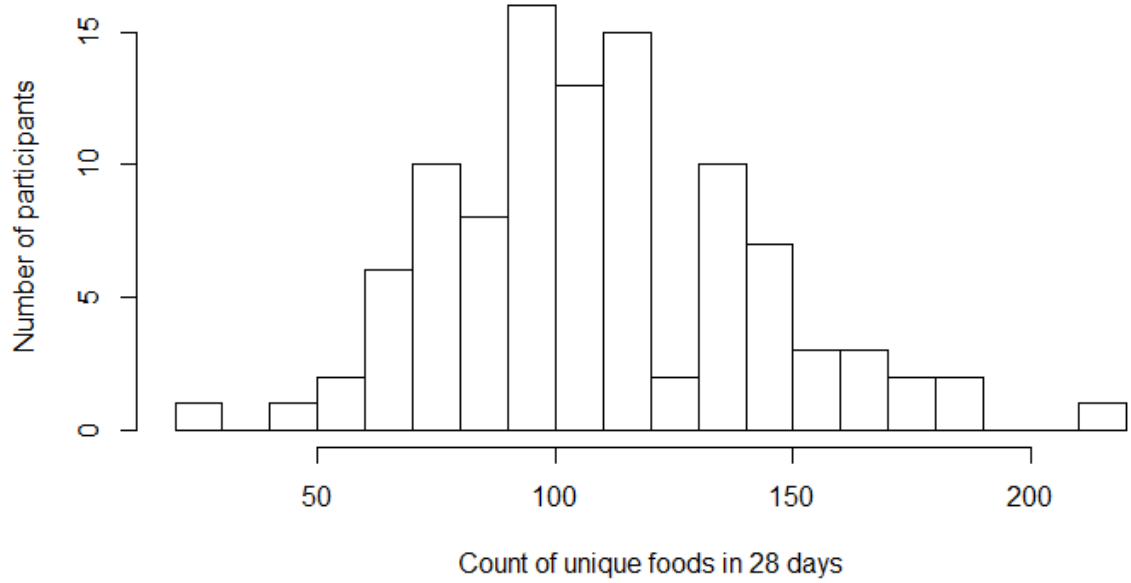


Figure 5.3: Distribution of the count of unique foods across participants (n = 102) over 28 days.

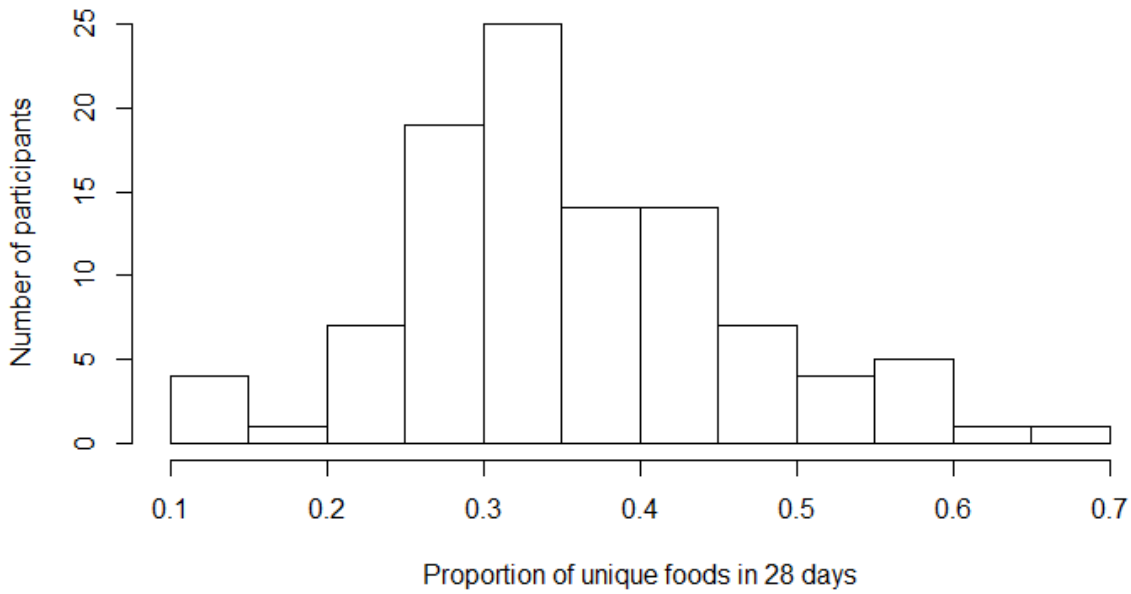


Figure 5.4: Distribution of the proportion of unique foods across participants (n = 102) over 28 days.

The rate at which participants' cumulative counts of unique foods increased was highest between the first and second weeks as well as the second and third weeks of the study period (**Figure 5.5**). The increasing cumulative counts of unique foods slowed for most participants between the third and fourth weeks of the study period (**Figure 5.5**). Most participants consumed over 50% of their counts of unique foods in 28 days during the first and second weeks of the study period (**Appendix K**). Most participants also consumed over 75% of their counts of unique foods in 28 days during the first three weeks of the study period (**Appendix K**).

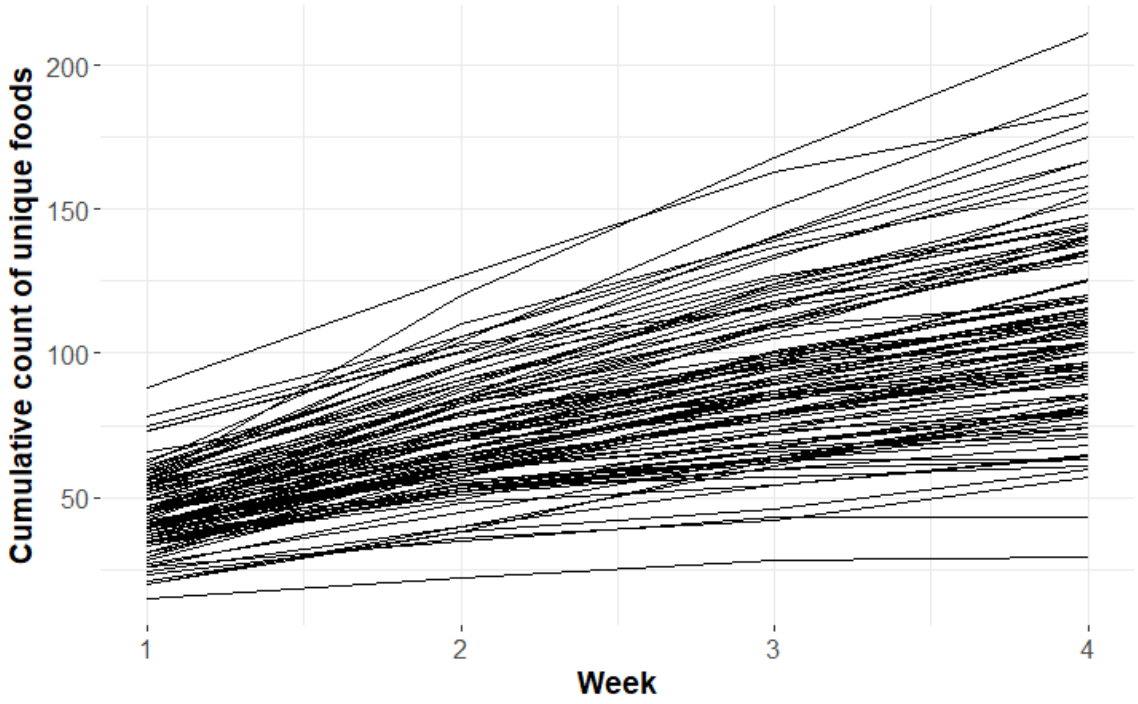


Figure 5.5: Cumulative count of unique foods over the four-week study period. Week 1 represents the count of unique foods consumed during the first week. Week 2 represents the count of unique foods consumed during the first and second weeks. Week 3 represents the count of unique foods consumed during the first, second, and third weeks. Week 4 represents the count of unique foods consumed during the first, second, third, and fourth weeks. A food that was consumed in two or more weeks of the study period was counted as one unique food in determining the cumulative count of unique foods.

For all participants, the highest total numbers of foods were consumed at breakfast, lunch, and dinner (**Table 5.1**). The average 28-day counts of unique foods increased from breakfast to lunch and from lunch to dinner (**Table 5.2**). The largest proportions of unique foods were consumed at lunch, dinner, and as early evening snacks (**Table 5.3**). The smallest proportion of unique foods at an eating occasion was consumed at breakfast (**Table 5.3**).

Female participants ate a significantly higher total number of foods in 28 days than did male participants over all eating occasions and for breakfast, dinner, morning

snack, afternoon snack, and total snack (**Table 5.1**). Female participants also consumed a significantly higher count of unique foods than did male participants in their 28-day total and for lunch, dinner, morning snack, afternoon snack, and total snack (**Table 5.2**). Men had a significantly higher proportion of unique foods for breakfast than did women (**Table 5.3**). The total number of foods, but not the count of unique foods, increased with participant age (**Figure 5.6**, **Table 5.4**). Through logistic regression, a one-year increase in participant age decreased the log odds of the proportion of unique foods (**Table 5.5**).

Table 5.1: Average 28-day total numbers of foods consumed over all eating occasions, each of the eating occasions, and total snack.

Participants	Eating occasion(s)								
	All eating occasions	Breakfast	Lunch	Dinner	Morning snack	Afternoon snack	Early evening snack	Late evening snack	Total snack
Female (n = 52)	355*	74*	73	85*	37*	35*	24	26	123*
Male (n = 50)	292	59	66	71	27	25	21	23	96
All (n = 102)	324	67	70	78	32	30	23	24	110

* Indicates the gender with a significantly higher mean for the eating occasion(s) ($p < 0.05$)

Table 5.2: Average 28-day counts of unique foods consumed over all eating occasions, each of the eating occasions, and total snack; average daily counts of unique foods over all eating occasions and over breakfast, lunch, and dinner.

Participants	Eating occasion(s)												
	All eating occasions		Breakfast		Lunch		Dinner		Morning snack	Afternoon snack	Early evening snack	Late evening snack	Total snack
	28 Days	Daily	28 Days	Daily	28 Days	Daily	28 Days	Daily	28 Days	28 Days	28 Days	28 Days	28 Days
Female (n = 52)	120*	8	22	3	41*	3	50*	3	14*	17*	13	13	42*
Male (n = 50)	99	9	19	2	35	3	42	3	9	11	11	11	31
All (n = 102)	110	8	21	2	38	3	46	3	12	14	12	12	37

* Indicates the gender with a significantly higher mean for the eating occasion(s) ($p < 0.05$)

Table 5.3: Average 28-day proportions of unique foods over all eating occasions, each of the eating occasions, and total snack.

Participants	Eating occasion(s)								
	All eating occasions	**Breakfast**	**Lunch**	**Dinner**	**Morning snack**	**Afternoon snack**	**Early evening snack**	**Late evening snack**	**Total snack**
Female (n = 52)	0.35	0.30	0.57	0.59	0.41	0.52	0.58	0.57	0.39
Male (n = 50)	0.36	0.39*	0.55	0.61	0.44	0.56	0.59	0.54	0.40
All (n = 102)	0.36	0.35	0.56	0.60	0.43	0.54	0.59	0.56	0.39

* Indicates the gender with a significantly higher mean for the eating occasion(s) ($p < 0.05$)

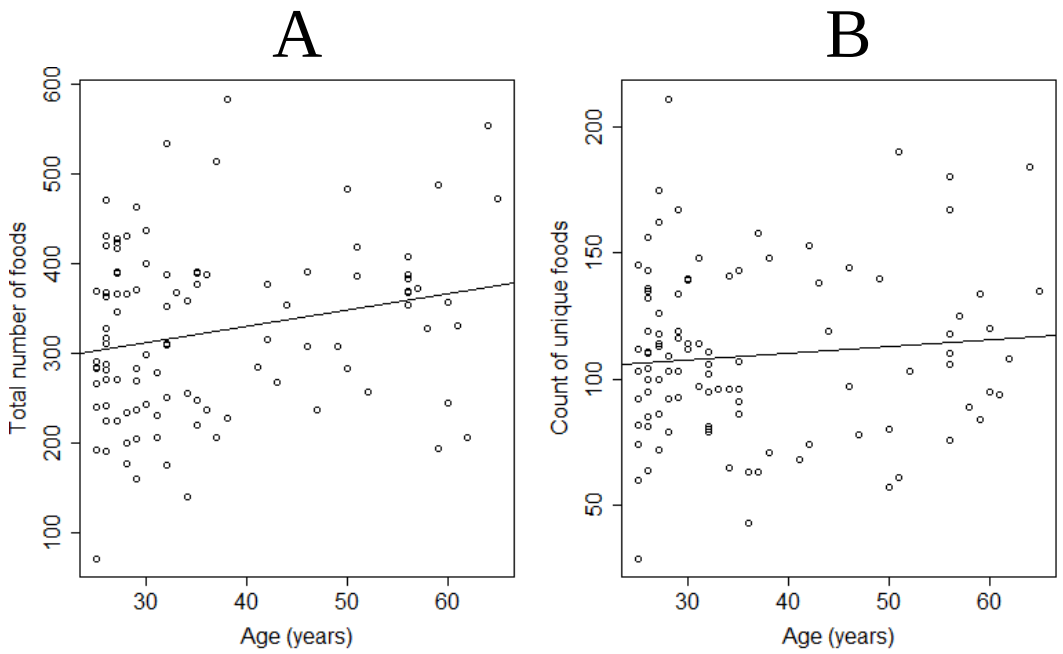


Figure 5.6: The (A) total number of foods and (B) count of unique foods consumed as a function of participant age (years). The least-squares regression lines are displayed. Parameter estimates are reported in **Table 5.4**.

Table 5.4: Parameter estimates of simple linear regression models of the (A) total number of foods and (B) count of unique foods as the dependent variables on participant age (years) as the independent variable. Regression coefficients, standard errors, t-values, p-values, and coefficients of determination (R^2) from simple linear regression models are reported.

Model	Coefficient	Standard error	Test statistic (t)	p-value	R^2
A					
Intercept	257.5	30.1	8.6	< 0.001	0.051
Age	1.8	0.8	2.3	0.02	
B					
Intercept	99.7	10.7	9.3	< 0.001	0.009
Age	0.3	0.3	1.0	0.34	

Table 5.5: Parameter estimates of logistic regression model of the proportion of unique foods as the dependent variable on participant age (years) as the independent variable. Regression coefficients, standard errors, z-values, p-values, odds ratios, and pseudo coefficient of determination (McFadden's R^2) from the logistic regression model are reported.

Model	Coefficient	Standard error	Test statistic (z)	p-value	Odds ratio	McFadden's R^2
Intercept	-0.5	0.0	-13.5	< 0.001	0.60	0.001
Age	0.0	0.0	-4.7	< 0.001	1.00	

5.1.2 Determining the impact of personality traits on dietary variety

Participants who had higher scores for boredom proneness consumed significantly smaller total numbers of foods (**Figure 5.7 C, Table 5.6**) and counts of unique foods (**Figure 5.8 C, Table 5.7**) compared to those with lower scores for boredom proneness. Participants with higher food neophobia scores consumed significantly smaller counts of unique foods than those with lower food neophobia scores (**Figure 5.8 A, Table 5.7**). Through logistic regression, a one-point increase in the food neophobia score decreased the log odds of the proportion of unique foods (**Table 5.8**). A one-point increase in the sensation-seeking tendency score and boredom proneness score increased the log odds of the proportion of unique foods (**Table 5.8**).

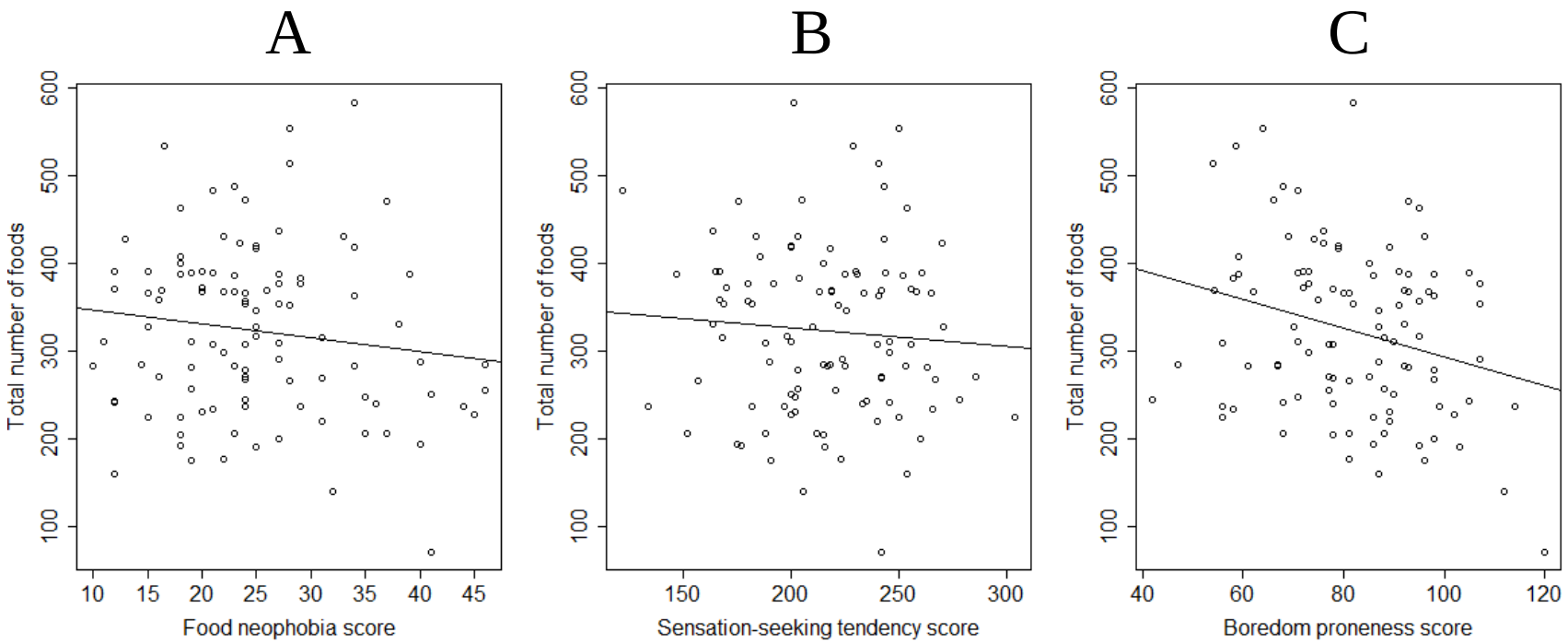


Figure 5.7: Total number of foods consumed as a function of (A) food neophobia score, (B) sensation-seeking tendency score, and (C) boredom proneness score. The least-squares regression lines are displayed. Parameter estimates are reported in **Table 5.6**.

Table 5.6: Parameter estimates of simple linear regression models of (A) food neophobia score, (B) sensation-seeking tendency score, and (C) boredom proneness score as the independent variables on the total number of foods as the dependent variable. Regression coefficients, standard errors, t-values, p-values, and coefficients of determination (R^2) from the simple linear regression models are reported.

Model	Coefficient	Standard error	Test statistic (t)	p-value	R^2
A					
Intercept	362.3	29.6	12.2	< 0.001	0.018
Food neophobia	-1.5	1.1	-1.4	0.17	
B					
Intercept	369.5	59.2	6.2	< 0.001	0.006
Sensation-seeking tendency	-0.2	0.3	-0.8	0.44	
C					
Intercept	458.1	49.3	9.3	< 0.001	0.072
Boredom proneness	-1.6	0.6	-2.8	0.01	

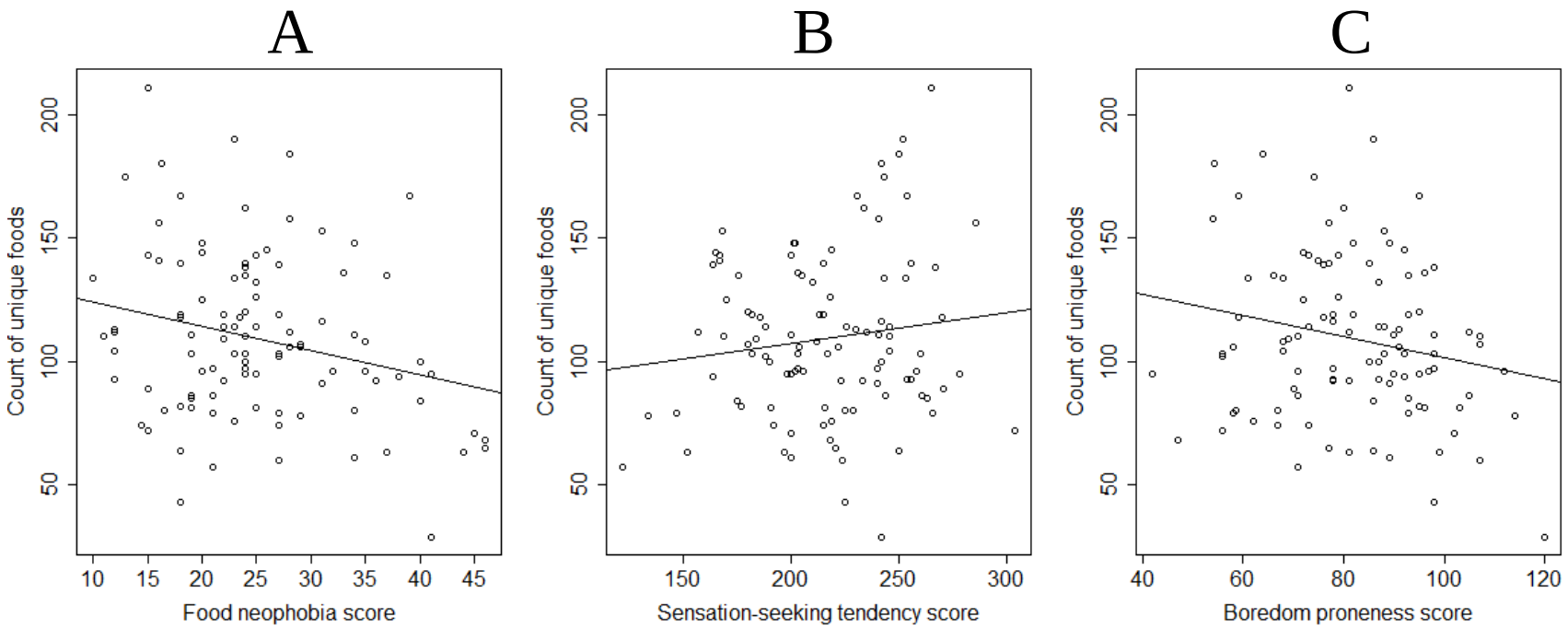


Figure 5.8: Count of unique foods consumed as a function of (A) food neophobia score, (B) sensation-seeking tendency score, and (C) boredom proneness score. The least-squares regression lines are displayed. Parameter estimates are reported in **Table 5.7**.

Table 5.7: Parameter estimates of simple linear regression models of (A) food neophobia score, (B) sensation-seeking tendency score, and (C) boredom proneness score as the independent variables on the count of unique foods as the dependent variable. Regression coefficients, standard errors, t-values, p-values, and coefficients of determination (R^2) from the simple linear regression models are reported.

Model	Coefficient	Standard Error	Test statistic (t)	p-value	R^2
A					
Intercept	133.9	10.1	13.3	< 0.001	0.061
Food neophobia	-1.0	0.4	-2.6	0.01	
B					
Intercept	82.3	20.5	4.0	< 0.001	0.018
Sensation-seeking tendency	0.1	0.1	1.3	0.18	
C					
Intercept	144.6	17.4	8.3	< 0.001	0.040
Boredom proneness	-0.4	0.2	-2.1	0.04	

Table 5.8: Parameter estimates of logistic regression models of (A) food neophobia score, (B) sensation-seeking tendency score, and (C) boredom proneness score as the independent variables on the proportion of unique foods as the dependent variable. Regression coefficients, standard errors, z-values, p-values, odds ratios, and pseudo coefficients of determination (McFadden's R^2) from the logistic regression models are reported.

Model	Coefficient	Standard Error	Test statistic (z)	p-value	Odds ratio	McFadden's R^2
A						
Intercept	-0.497	0.04	-13.2	< 0.001	0.61	0.010
Food neophobia	-0.007	0.00	-4.8	< 0.001	1.00	
B						
Intercept	-1.261	0.07	-17.3	< 0.001	0.28	0.030
Sensation-seeking tendency	0.003	0.00	8.2	< 0.001	1.00	
C						
Intercept	-0.823	0.06	-12.9	< 0.001	0.44	0.003
Boredom proneness	0.002	0.00	2.4	0.02	1.00	

5.1.3 Determining the impact of variety on satisfaction with weekly variety

Data trends (**Figure 5.9**) and linear mixed-effects analyses with repeated measures (**Table 5.9**) showed little effect of the weekly total numbers of foods, weekly counts of unique foods, and weekly proportions of unique foods on the ratings of satisfaction with variety across participants.

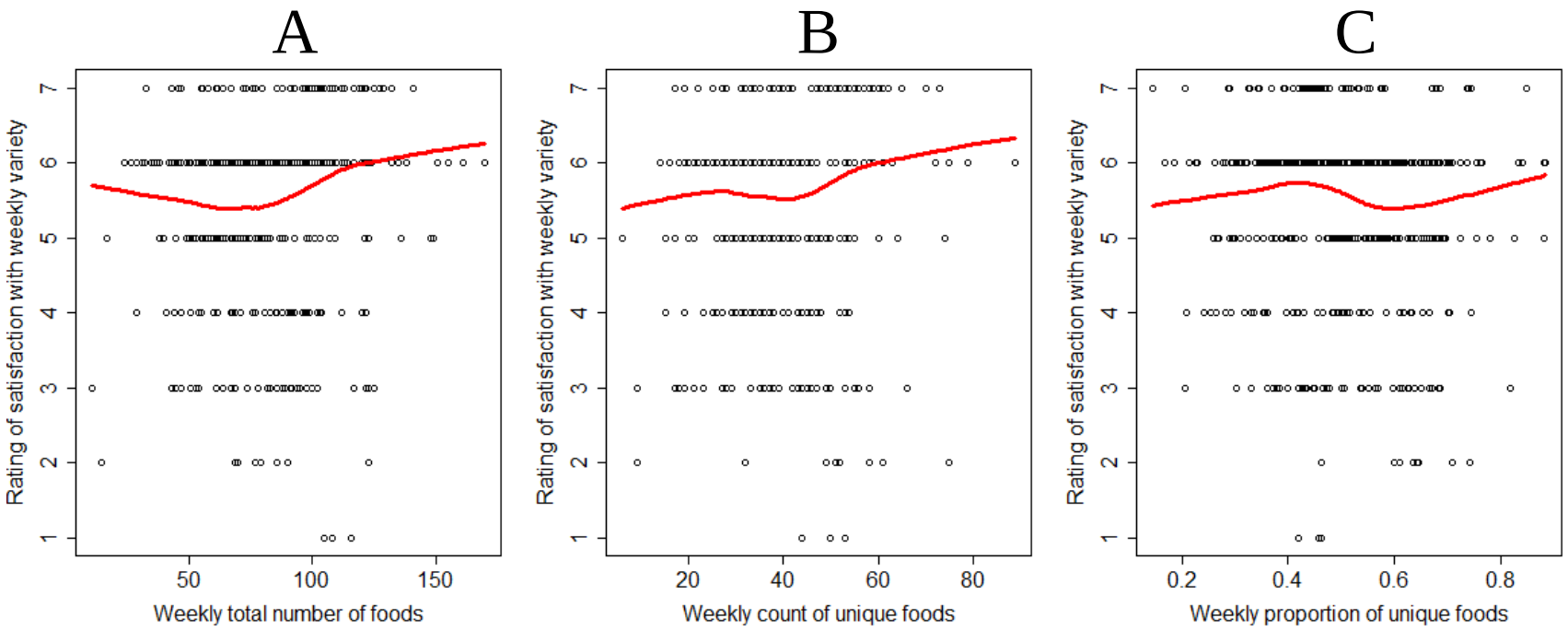


Figure 5.9: Scatterplots representing the ratings of satisfaction with weekly variety (1: completely dissatisfied; 7: completely satisfied) and the (A) weekly total numbers of foods, (B) weekly counts of unique foods, and (C) weekly proportions of unique foods across participants. Locally weighted scatterplot smoothing lines are displayed in red.

Table 5.9: Parameter estimates of linear mixed-effects analyses of the (A) weekly total number of foods, (B) weekly counts of unique foods, or (C) weekly proportions of unique foods as the independent variables on the ratings of satisfaction with weekly variety as the dependent variable. Regression coefficients, standard errors, t-values, and approximate p-values from the repeated measures linear mixed-effects models are reported.

Model	Coefficient	Standard error	Test statistic (t)	p-value
A				
Intercept	5.30	0.30	20.7	< 0.001
Weekly total number of foods	0.00	0.00	0.0	1.00
B				
Intercept	5.50	0.20	23.5	< 0.001
Weekly count of unique foods	-0.01	0.01	-0.9	0.39
C				
Intercept	5.50	0.30	19.2	< 0.001
Weekly proportion of unique foods	-0.50	0.50	-0.9	0.37

5.2 Measuring the impact of choice influencers on food choice

5.2.1 Determining the importance of each choice influencer on food choice

Liking, convenience, and hunger were most frequently reported to have high impact on food selection (**Figure 5.10**). The 'presence on a menu,' 'only thing served,' and 'special occasion' were most frequently reported to have no impact on food selection (**Figure 5.10**).

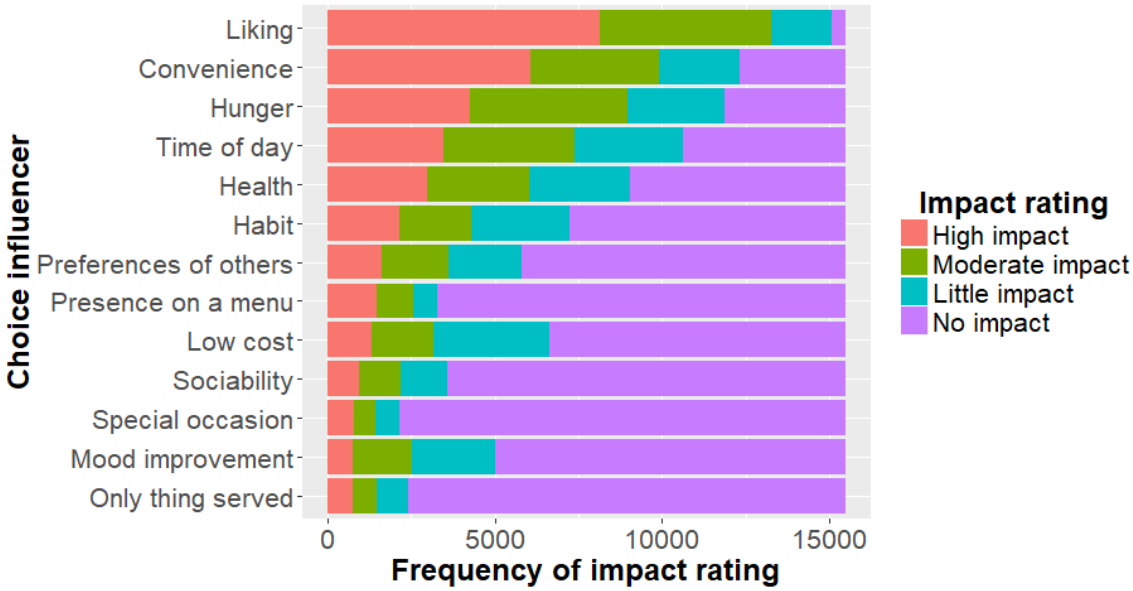


Figure 5.10: Frequencies that choice influencers were reported to have high, moderate, little, and no impact on selection over all foods consumed.

5.2.2 Determining the importance of each choice influencer on the consumption of specific food classes

The frequencies with which choice influencers were rated as having high impact, moderate impact, little impact, and no impact differed by food class (**Figure 5.11**, **Figure 5.12**, **Figure 5.13**, **Figure 5.14**). Liking was most frequently rated as having high impact on the consumption of the majority of food classes. The 'only thing served' and 'special

occasion' were most frequently selected as having no impact for the majority of food classes.

Many food classes (dairy, eggs, entrees, fats, fruits, grains, meats, miscellaneous, soups, and vegetables) showed similar patterns of impact rating frequency for choice influencers (**Figure 5.11**, **Figure 5.12**, **Figure 5.13**, **Figure 5.14**). However, some food classes displayed different patterns. For example, hunger was most frequently selected as having no impact on the consumption of alcohol (**Figure 5.11**). In addition to liking, 'time of day' and sociability were frequently rated as having high impact on the consumption of alcohol (**Figure 5.11**). Health and habit were most frequently selected as having high impact on the consumption of water (**Figure 5.14**). Further, 'special occasion' was most frequently selected as having no impact on the consumption of water (**Figure 5.14**).

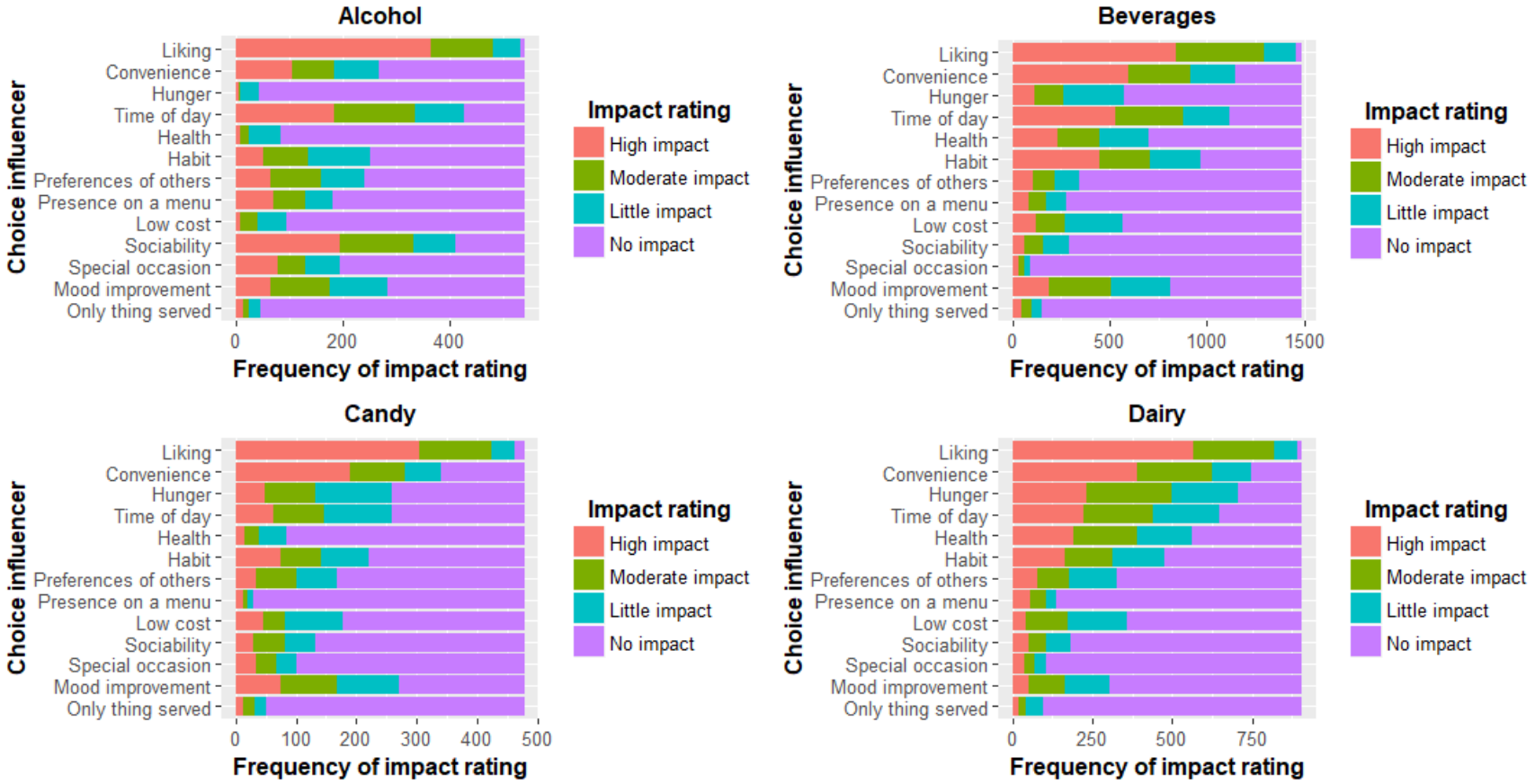


Figure 5.11: Frequencies that choice influencers were reported to have high, moderate, little, and no impact on consumption across participants for the following food classes: alcohol, beverages, candy, and dairy.

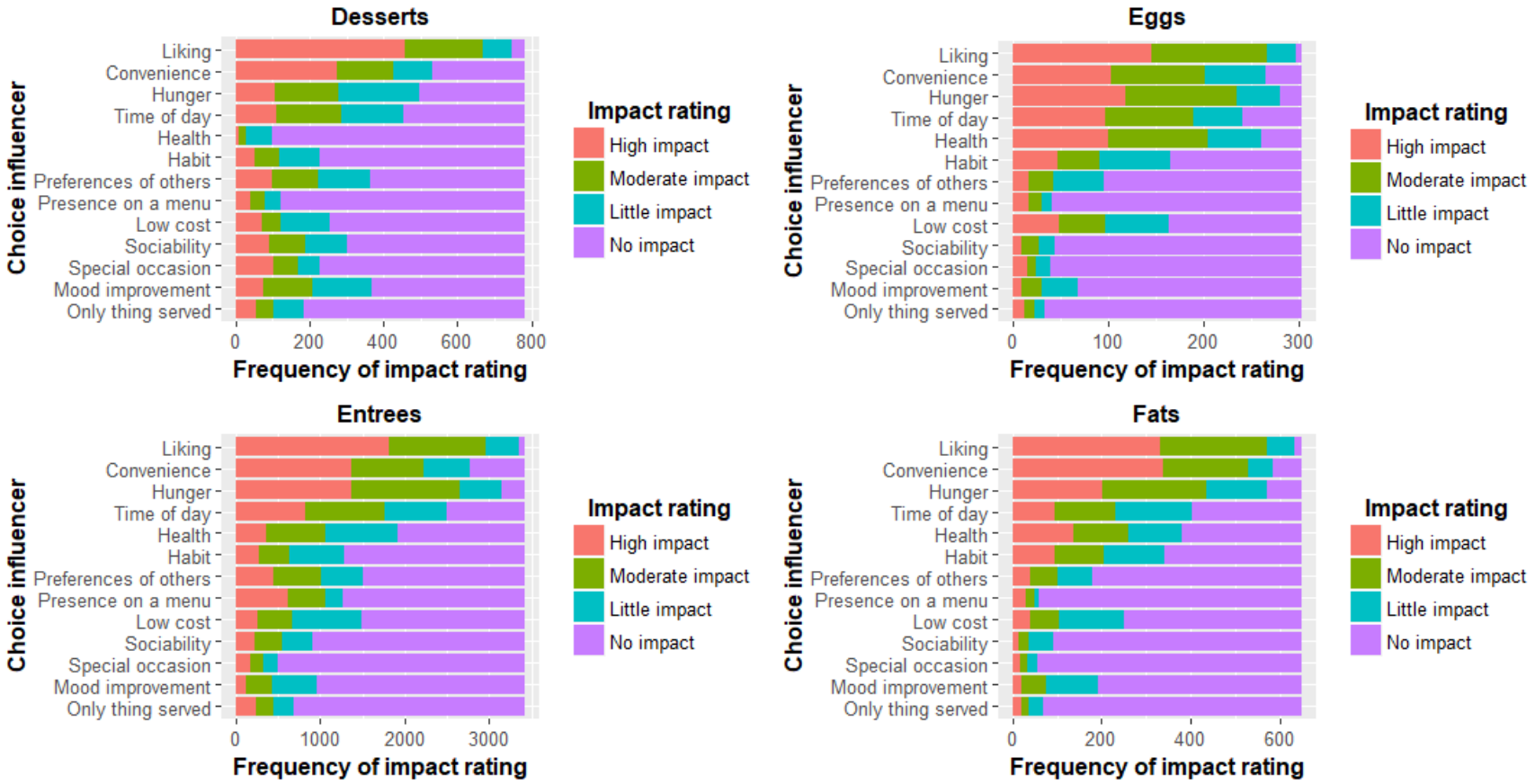


Figure 5.12: Frequencies that choice influencers were reported to have high, moderate, little, and no impact on consumption across participants for the following food classes: desserts, eggs, entrees, and fats.

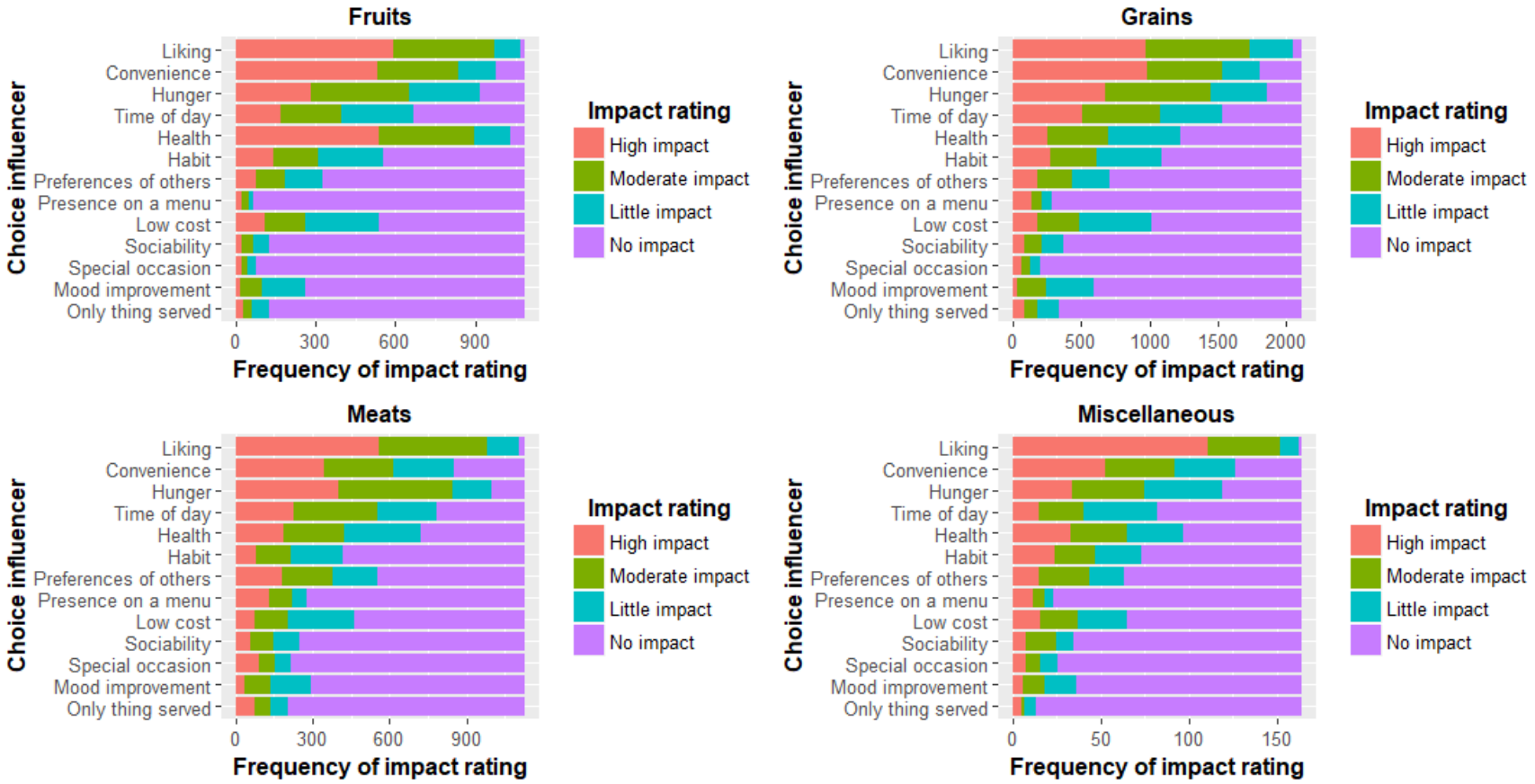


Figure 5.13: Frequencies that choice influencers were reported to have high, moderate, little, and no impact on consumption across participants for the following food classes: fruits, grains, meats, and miscellaneous.

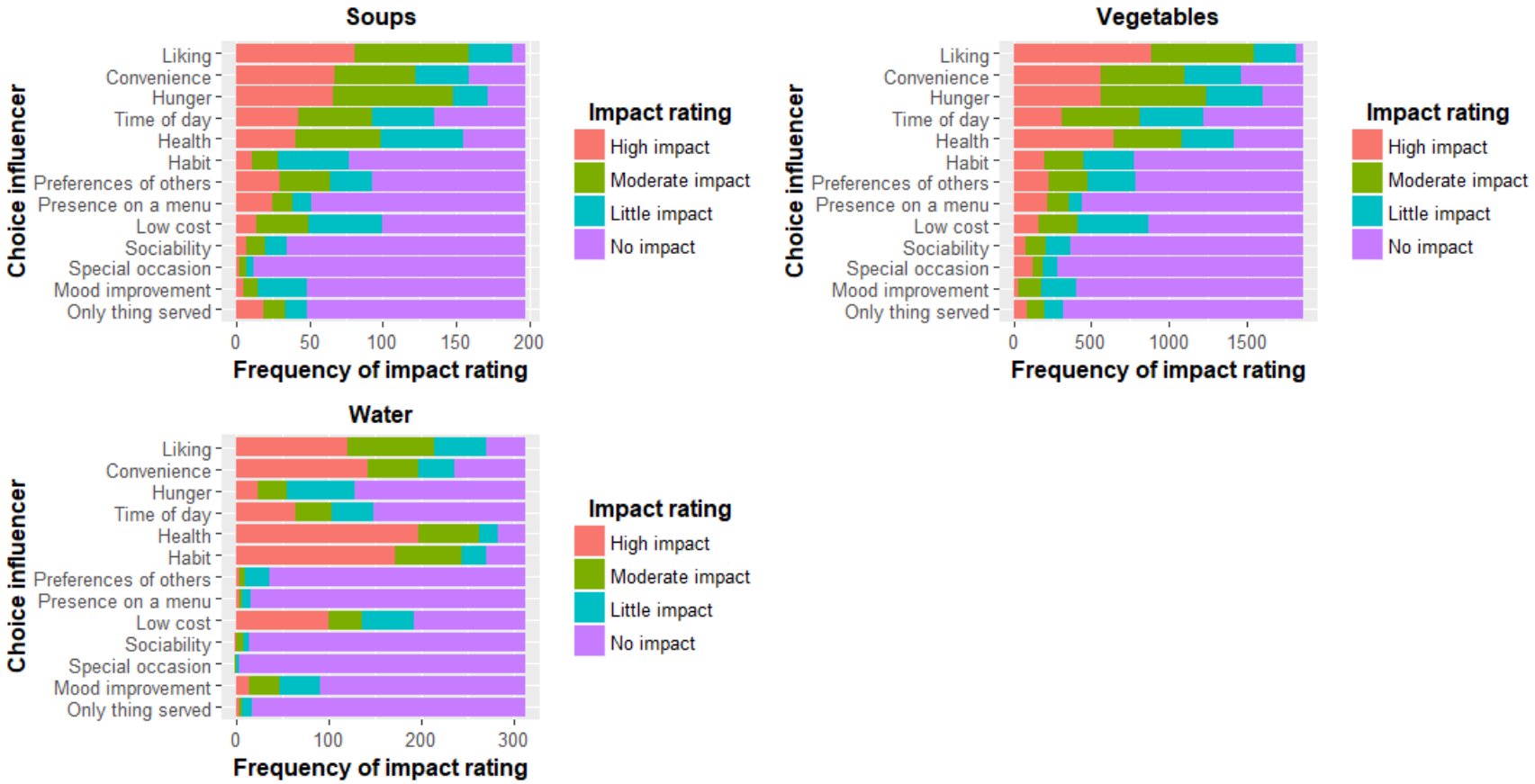


Figure 5.14: Frequencies that choice influencers were reported to have high, moderate, little, and no impact on consumption across participants for the following food classes: soups, vegetables, and water.

5.2.3 Determining associations between choice influencers and specific food classes

Through the Parafac analysis, three components were identified to best explain the covariation between food classes and choice influencers. The three components accounted for about 30% of the variation in the data. Each of the food classes and choice influencers within each component had a numerical loading (meaningful loadings $\geq |0.5|$; see **Table 5.10** for loadings). Only meaningful food classes and choice influencers were plotted (**Figure 5.15**, **Figure 5.16**).

Results from the Parafac analysis suggested that the first component was defined by health and hunger with highly positive loadings and by sociability and 'special occasion' with highly negative loadings. The fruits, vegetables, and entrees food classes were associated with health and hunger (**Figure 5.15**). The alcohol, candy, and desserts food classes were associated with sociability and 'special occasion' (**Figure 5.15**).

The second component was defined by habit and health with highly positive loadings and by 'preferences of others' and hunger with highly negative loadings. The consumption of water was associated with habit and health (**Figure 5.15**). The desserts, entrees, and meats food classes were associated with 'preferences of others' and hunger (**Figure 5.15**).

The third component was defined by liking, 'time of day,' and convenience with highly positive loadings and by sociability, 'special occasion,' and 'only thing served' with highly negative loadings. The grains, fats, and entrees food classes were associated with liking, 'time of day,' and convenience (**Figure 5.15**, **Figure 5.16**). The consumption

of the miscellaneous food class was somewhat associated with sociability, 'special occasion,' and 'only thing served' (**Figure 5.15**, **Figure 5.16**).

Table 5.10: Loadings in three components for food classes and choice influencers following Parafac analysis.

		Parafac loadings		
		Component 1	**Component 2**	**Component 3**
Food class	**Alcohol**	-2.63	-0.63	-1.60
	Beverages	-1.18	1.06	0.76
	Candy	-1.04	-0.26	-0.40
	Dairy	0.12	0.09	0.78
	Desserts	-1.07	-1.01	-0.48
	Eggs	0.88	0.08	0.61
	Entrees	0.48	-0.98	0.81
	Fats	0.41	-0.18	0.89
	Fruits	1.21	0.80	0.78
	Grains	0.53	-0.18	1.16
	Meats	0.52	-0.95	0.47
	Miscellaneous	-0.11	-0.22	-2.24
	Soups	0.57	-0.49	-0.79
	Vegetables	0.84	-0.21	0.32
	Water	0.47	3.08	-1.07
Choice influencer	**Convenience**	0.17	0.37	1.49
	Habit	-0.45	2.10	0.16
	Health	1.76	1.68	-0.40
	Hunger	2.09	-1.62	0.96
	Liking	-0.97	-0.14	1.88
	Low cost	0.63	0.84	-0.81
	Menu	0.05	-0.69	-0.86
	Mood improvement	-1.28	0.20	-0.25
	Preferences of others	0.00	-0.98	-0.54
	Only thing served	0.36	-0.44	-1.00
	Sociability	-1.27	-0.54	-0.95
	Special occasion	-0.52	-0.57	-0.94
	Time of day	-0.59	-0.20	1.27

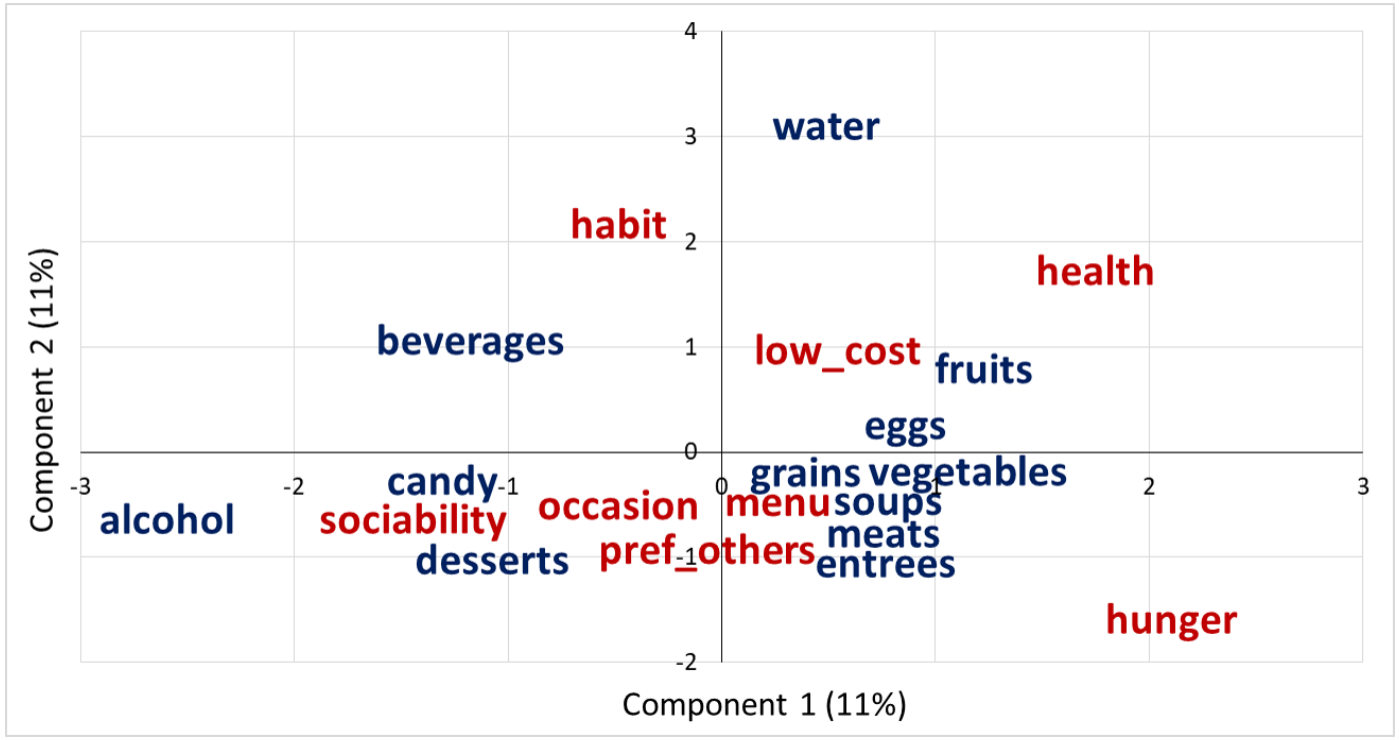


Figure 5.15: Components 1 and 2 of Parafac analysis on choice influencer (red) and food class (blue) loadings. The percent of the variation accounted for by each component is in parentheses. The 'special occasion' choice influencer was represented on this plot as "occasion;" the 'preferences of others' choice influencer was represented on this plot as "pref_others;" the 'presence on a menu' choice influencer was represented on this plot as "menu;" the 'low cost' choice influencer was represented on this plot as "low_cost."

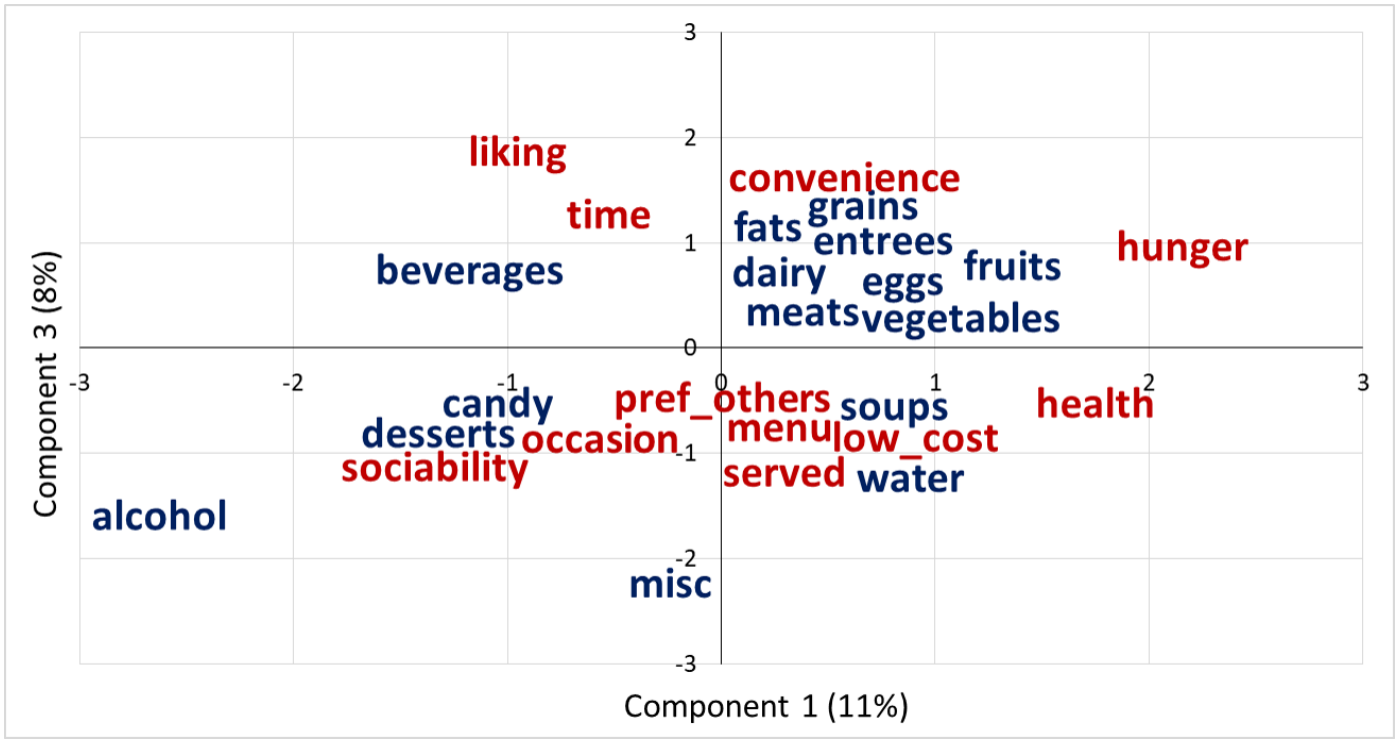


Figure 5.16: Components 1 and 3 of Parafac analysis on choice influencer (red) and food class (blue) loadings. The percent of the variation accounted for by each component is in parentheses. The 'special occasion' choice influencer was represented on this plot as "occasion;" the 'preferences of others' choice influencer was represented on this plot as "pref_others;" the 'presence on a menu' choice influencer was represented on this plot as "menu;" the 'low cost' choice influencer was represented on this plot as "low_cost;" the 'time of day' choice influencer was represented on this plot as "time;" the 'only thing served' choice influencer was represented on this plot as "served;" the miscellaneous food class was represented on this plot as "misc."

5.2.4 Determining the impact of choice influencers on satisfaction with weekly variety

Participants' satisfaction with weekly variety in their diets was best predicted by high ratings of liking with the foods consumed. Participants' satisfaction with weekly variety was reduced by high ratings of convenience with the foods consumed (**Table 5.11**). Hunger approached significance ($p = 0.06$) in increasing satisfaction with weekly variety (**Table 5.11**).

Table 5.11: Parameter estimates of linear mixed-effects analyses of the weekly choice influencer impact ratings as independent variables on ratings of satisfaction with weekly variety as dependent variables. Regression coefficients, standard errors, t-values, and approximate p-values from repeated measures linear mixed-effects model are reported.

Model parameters	Coefficient	Standard error	Test statistic (t)	p-value
Intercept	3.46	0.82	4.2	< 0.001
Liking	0.74	0.24	0.3	0.002
Convenience	-0.31	0.14	-2.2	0.03
Hunger	0.33	0.18	1.8	0.06
Time of day	-0.20	0.15	-1.3	0.20
Health	0.08	0.17	0.5	0.61
Habit	-0.14	0.18	-0.8	0.42
Preferences of others	0.00	0.17	0.0	0.98
Presence on a menu	0.10	0.18	0.5	0.59
Low cost	0.16	0.15	1.1	0.28
Sociability	-0.20	0.24	-0.8	0.41
Special occasion	-0.10	0.23	-0.4	0.66
Mood improvement	-0.24	0.16	-1.5	0.14
Only thing served	0.25	0.23	1.1	0.28

Shading indicates a significant ($p < 0.05$) impact of the choice influencer on ratings of satisfaction with weekly variety

Chapter 6: Discussion

In general, we observed that female participants consumed more dietary variety than did male participants, which may be attributed to female participants' familiarity with cooking, lesser likelihood of eating out, and consumption of smaller portions. It has been found that men have reduced knowledge of and interest in cooking perhaps leading them to consume less variety in their diets than women (Krondl et al., 1982). However, the research supporting this finding has been evaluated in elderly populations (Krondl et al., 1982), potentially limiting its' applicability outside of that age group. Driskell, Meckna, and Scales (2006) found that college-aged men consumed fast food for lunch more frequently than did college-aged women. As college-aged men may commonly consume lunch at fast food restaurants, they may also consume the same foods repeatedly for lunch at those restaurants, leading to less dietary variety. The researchers also found that college-aged men were less likely than college-aged women to consider portion sizes when ordering at fast food restaurants. That finding may suggest that men consume fewer unique foods but larger portions to reach fullness, ultimately resulting in less dietary variety.

Researchers have reported that college-aged men are less likely than college-aged women to eat breakfast (Li et al., 2012; Musingo & Wang, 2009). Phan and Chambers (2016a) found that the consumption of foods at breakfast is more driven by habit than at dinner. Thus, individuals may be more likely to repeat foods out of habit at breakfast. If male participants in this study consumed breakfast less frequently than did female

participants, fewer repeated foods would have been consumed out of habit, feasibly leading to a higher proportion of unique foods for male participants.

Individuals have an ideal amount of dietary variety and consume that amount of dietary variety to be satisfied and to manage their levels of boredom proneness. It is a commonly-understood economic principle that a rational consumer will maximize their satisfaction in life (e.g. Simon, 1978). As we observed no association between participants' ratings of satisfaction with variety and participants' counts of unique foods or proportions of unique foods, we can suggest that the participants consumed their ideal amount of dietary variety to remain satisfied. Further, we observed that participants who were more prone to boredom consumed smaller counts of unique foods than did those who were less prone to boredom. Faison (1977) described that boredom is a driver of variety, as variety provides a "change of pace" for individuals to cope with their levels of boredom. Unexpectedly, we observed a significant, inverse relationship between participants' levels of boredom proneness and their counts of unique foods. As the participants in the present study were free-living, they had full control of changing the pace of their diets, thereby adjusting the amount of dietary variety to manage their levels of boredom proneness. Perhaps the scores of boredom proneness were not directly related to the count of unique foods because of the participants' ability to adjust the amount of dietary variety consumed to avoid boredom.

Our study and others (Phan & Chambers, 2016b) have shown differences among alcohol, beverages, and water food classes. The consumption of alcohol was more driven by sociability than were beverages or water (**Figure 6.1**), an observation also seen by

Phan and Chambers (2016b). We found water to be more driven by health and habit than were alcohol or beverages (**Figure 6.1**). Phan and Chambers (2016b) also found the consumption of water to be more highly driven by health and weight control than were other beverages. Overall, our findings on the choice influencers responsible for driving the consumption of alcohol, beverages, and water were consistent with those in the published literature. However, the alcohol, beverages, and water food classes did not include all possible drinks in this study. For example, fruit juices were placed in the fruits food class, vegetable juices were placed in the vegetables food class, and milk was placed in the dairy food class. Therefore, comparing the motivations of alcohol, beverages, and water to those of other drinks, such as fruit juices, vegetable juices, or milk, could unveil additional differences in motivations for consuming various types of drinks.

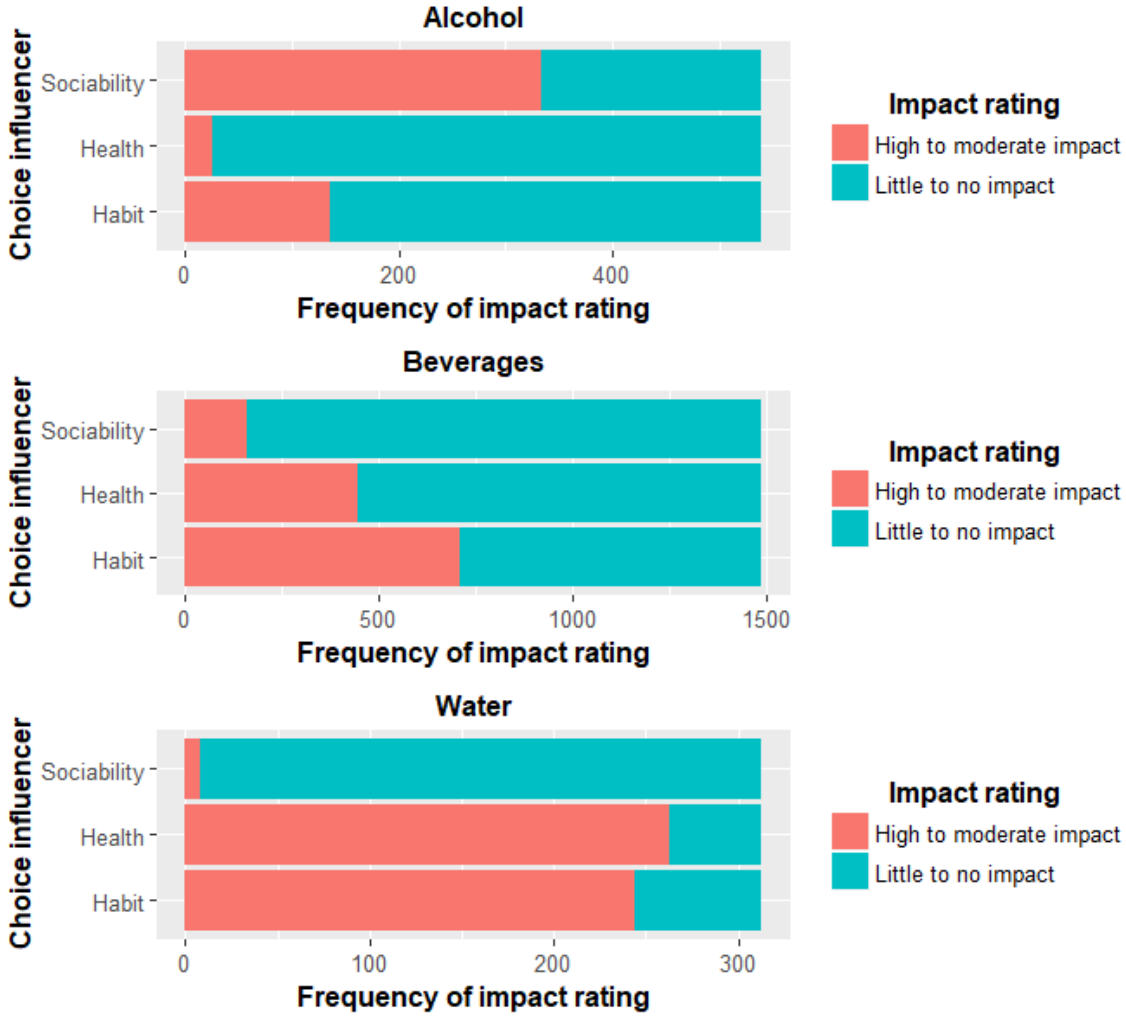


Figure 6.1: Frequencies that choice influencers (sociability, health, habit) were reported to have high to moderate impact and little to no impact on consumption across participants for the following food classes: alcohol, beverages, and water. Choice influencer impact ratings were combined to have a high to moderate impact rating and a low to no impact rating.

The 13 choice influencers used did not fully capture the complexity of food choice. For example, some food classes, such as the miscellaneous food class were not closely associated with any meaningful choice influencers in the Parafac analysis. The miscellaneous food class included foods such as salsa and guacamole. We hypothesize that because foods within the miscellaneous class are commonly consumed with other food classes (e.g. vegetables, grains), the 13 choice influencers in this study did not fully capture the motivations for the consumption of miscellaneous foods. Including additional choice influencers such as "this food is commonly consumed with another food" could provide insight on the consumption of miscellaneous foods and better capture the complexity of food choice.

Liking drives the consumption of most foods, regardless of how healthy the foods are. This was demonstrated in the proportion of times liking was rated as having high to moderate impact on the consumption of each food class (**Table 6.1**). In most food classes, liking was rated as having high to moderate impact on consumption over 80% of the time (**Table 6.1**). Notably, liking was rated to have high to moderate impact on the consumption of healthier food classes such as the fruits food class (0.89) and the vegetables food class (0.83) at similar proportions as less healthy food classes such as the alcohol food class (0.89) and the desserts food class (0.86) (**Table 6.1**). The water food class had the lowest proportion of times that liking was rated as high to moderate impact on consumption (0.69) (**Table 6.1**). We hypothesize that the choice of water may have been more highly impacted by other choice influencers, such as habit, and thus less highly impacted by liking. The choice of water may have also been impacted by thirst;

however, a choice influencer describing thirst was not used in the present study. Overall, these results suggest that liking drives the consumption of most foods, regardless of how healthy they are.

Table 6.1: Proportions of times that liking was selected as having high to moderate impact on the consumption of each food class. Choice influencer impact ratings were combined to have a high to moderate impact rating.

Food class	Proportion of times that liking had high to moderate impact on consumption
Alcohol	0.89
Beverages	0.87
Candy	0.89
Dairy	0.91
Desserts	0.86
Eggs	0.88
Entrees	0.86
Fats	0.88
Fruits	0.89
Grains	0.82
Meats	0.87
Miscellaneous	0.83
Soups	0.81
Vegetables	0.83
Water	0.69

An individual's food choices are highly dictated by their culture (Rozin, 2007). However, in the present study and in others (Phan & Chambers, 2016a, 2016b; Renner et al., 2012), cultural motivations were not included as potential drivers for food choice. Furst and colleagues (1996) found that culture highly impacts food choice particularly at holidays and religious gatherings. For example, it may be unusual for individuals in Western countries to attend a special event or holiday where meat is not the main meal component, but having meat as a main meal component may not be a common practice in other cultures (Mela, 1999). As the present study spanned over several months, the

likelihood of participants' food diaries overlapping with cultural and religious holidays or other special occasions was high. Additional cultural impacts on food choice during this study may have included the memories of foods and connections to locations or times (e.g. Fieldhouse, 1995; Holtzman, 2006), or the participation in traditions such as communion (e.g. Fieldhouse, 1995). To account for these cultural motivations for food choice, it would have been beneficial to include a choice influencer specific to culturally-based food decisions.

CONCLUSION

Participants consumed an average of 110 unique foods over 28 days, consuming the highest count of unique foods at dinner, followed by lunch, and then breakfast. The proportions of unique foods were highest for lunch, dinner, early evening snack, and late evening snack. Females, on average, consumed a higher count of unique foods than males over all eating occasions and for lunch, dinner, morning snack, afternoon snack, and total snack while males consumed a higher proportion of unique foods than females for breakfast. Liking, hunger, and convenience were found to have the highest impact on overall food choice. Similarly, liking had the greatest impact on the consumption of specific food classes. Satisfaction with weekly variety was best predicted by liking ratings; convenience generally reduced satisfaction with weekly variety.

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APPENDICES

Appendix A: Recruitment flyer

Food Diary Study

A study conducted by the
Department of Food Science and Nutrition

We are recruiting participants for a month-long paid research study about the foods and beverages people consume.

This study requires participants to attend one introductory session and to complete daily food diaries for 28 consecutive days and a final questionnaire. You will be compensated up to $50 for completing all parts of this study.

To participate in this study, you must:

- Be 25 years of age or older
- Have obtained a bachelor's degree
- Be the primary decision maker for purchasing and preparing the foods you eat

Thank you for your interest!
For more information, please email
wisdo020@umn.edu.

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Appendix B: Recruitment email

Hello, my name is Lauren Wisdorf and I am a current graduate student pursuing a master's degree in Food Science at the University of Minnesota. I will be conducting a study regarding the assortment of foods and beverages people consume over a 28-day period.

This study requires one 15 to 30-minute, in-person, introductory session to acquaint you with the study. You will then be asked to track all foods and beverages you consume for 28 days using a shared Google Drive Sheet. Approximately one week after you finish the 28 food diaries, you will be emailed a final questionnaire (45-60 minutes) to be completed.

You will be compensated up to $50 for completing all parts of this study.

To be eligible for this study, you must be at least 25 years of age, have obtained a bachelor's degree, and must be the primary decision maker for purchasing and preparing the foods you eat. You must not also be enrolled in the ongoing Sensory Center yogurt 'take-home' study to participate in this research.

To show your interest in participating in this study, please click on the link below to complete a 5-minute screener. If you qualify for this study, I will contact you within two days to set up an introductory session.

Link to screener:

Thank you for your interest in participating in this research study!

Lauren Wisdorf

Appendix C: Qualtrics online screener

Please read the following description carefully before continuing with the survey:

We are recruiting both men and women for a 28-day study on the foods people eat. Participants must be 25 years of age or older, have achieved a bachelor's degree, and be the primary decision maker for purchasing and preparing the foods they eat. Participants in this study may not be subjects in the ongoing Sensory Center "take-home" yogurt study.

The purpose of this Food Diary Study is to determine the foods and beverages people consume during a typical month. You will be asked to attend one 15 to 30-minute introductory session, maintain a thorough food diary of all foods and beverages consumed daily over a 28-day period, and complete four weekly questionnaires about the foods you ate during that week.
Participants will be compensated up to a total of $50 after they have finished all parts of the study.

All information you provide in this survey is strictly confidential.

Please enter your email address:

_____

Please enter your first and last name:

_____

What is your gender?

- o Male
- o Female

Please enter your date of birth (mm/dd/yyyy):

_____

Please enter your mailing address (for payment distribution):

_____

Do you have any food allergies or sensitivities?

- o Yes
- o No

Are you the primary decision maker in your household for the purchase and preparation of the foods your eat?

- o Yes
- o No

When was your bachelor’s degree awarded? (mm/yyyy)

_____

In what field was your bachelor’s degree awarded?

_____

From which institution was your bachelor’s degree awarded?

_____

What country do you consider to be your culinary home? (By culinary home we are referring broadly to food choices and cooking methods)

_____

What type (cuisine, nationality, region, etc.) of food do you primarily eat at home?

_____

In what country did you live duringthe majority of years between the ages of 5 and 18?

_____

These next questions are about the food eaten in your household in the last 12 months:
QA: “The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- Don’t know/Refuse to answer

QB: "(I/we) couldn't afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- Don’t know/Refuse to answer

QC: In the last 12 months, did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
- No
- Don’t know/Refuse to answer

If *Yes* was selected in response to QC:

How often did (you/you or other adults in your household) cut the size of your meals or skip meals because there wasn't enough money for food? --almost every month, some months but not every month, or in only 1 or 2 months?

- Almost every month
- Some months but not every month
- Only 1 or 2 months
- Don’t know/Refuse to answer

If *Often true* or *Sometimes true* was selected in response to QA or *Often true* or *Sometimes true* was selected in response to QB or *Yes* was selected in response to QC:

In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?

- Yes
- No
- Don’t know/Refuse to answer

If *Often true* or *Sometimes true* was selected in response to QA or *Often true* or *Sometimes true* was selected in response to QB or *Yes* was selected in response to QC:

In the last 12 months, were you every hungry but didn't eat because you couldn't afford enough food?

- Yes
- No
- Don’t know/Refuse to answer

Please click the arrows (>>) below to submit this survey!

Thank you for your interest in participating in the Food Diary Study.

Your information will be evaluated to determine if you qualify to participate in this study. If you do, we will contact you within two days to schedule your introductory session. If you have not heard back within two days, you can assume that you did not qualify for this study. You may choose not to participate, even if you have qualified.

If you have any questions about the study, please contact Lauren Wisdorf at wisdo020@umn.edu.

Appendix D: Introductory session script

Welcome to the Food Diary Study!

Thank you for your interest in participating. My name is Lauren Wisdorf and I, along with Zata Vickers from the Department of Food Science and Nutrition, Joe Redden from the Marketing Department, and Traci Mann from the Psychology Department, are conducting a month-long study on the foods and beverages people consume.

The purpose of this introductory session is to go over the consent form and answer any questions you may have in participating in this study.

There will be three parts to this study:

1. The introductory session
2. The food diary segment
3. The final questionnaire

The food diary segment of this study is where you will complete online food diaries using a shared Google Drive Sheet for 28 consecutive days. You may also complete your diaries on your mobile device using the Google Sheet App. Are you familiar with Google Drive? (Show the process of entering data). At each of the meal occasions, we ask that you list the names of foods and beverages you consume. If you do not consume anything, please leave the area blank. In terms of the entries, we do not need to know recipes or quantities of what you have eaten, rather how you would name that specific food. Give example of pizza, the pizzas must be importantly different to distinguish on the food diary. Home versus restaurant spinach salads.
Every night at about 8 pm, you will be emailed with a reminder to complete your food diary that day. You may also unsubscribe from those emails.

After completing the food diaries, within one week you will be emailed a link to a personal final questionnaire which will take you 45 min to an hour where you will be asked about the foods you ate.

You will be compensated a total of $50 for your participation in all parts of this study. After this introductory session, you will be compensated $5. Following the food diary segment, you will be compensated $20 by mailed check. Lastly, following the final questionnaire, you will be compensated the final $25 by mailed check. Note that after this session, you will not be required to come in at any other time. To mail you checks, you will need to fill out the following forms that I will submit once you have completed the necessary parts. (Fill out forms). The turnaround time is very quick for these checks, so you should have them within about a week of finishing the part. We ask that you will have completed the final questionnaire within one week of receiving the link.

Next, I would like you to read over our consent form. (Hand consent form). Please feel free to ask any questions you may have at this time. If you agree to participate, please sign and date the form. I will also provide you with a blank form for you to take home, if you are interested.

Today I will share your personal Google Drive sheet with you via email. You will begin on this date _____ until _____. (Give reminder slip)
Now that you've read the consent form, I just have a few follow-up questions to check your understanding!

1. How many days will you be required to complete food diaries? 28 consecutive days
2. How long do you have to complete the final questionnaire? 1 week
3. What is the total amount you will be paid? $50
4. How will you be paid after finishing the food diaries and final questionnaire? Mailed check

Great! Now here is your first payment of $5. Your Google Drive sheet will be shared with you today. If you come up with any problems or questions, don't hesitate to email me directly at wisdo020@umn.edu. My email address is on the consent form given to you and I check it frequently.

Appendix E: Consent form

CONSENT FORM
Food Study

You are invited to be in a research study on food. You were selected as a possible participant because you indicated your interest in this research study. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

If you are under the age of 18, please let the research assistant know.

This study is being conducted by:
Traci Mann (University of Minnesota, Department of Psychology)
Joseph Redden (University of Minnesota, Department of Marketing & Logistics Management)
Zata Vickers (University of Minnesota, Department of Food Science and Nutrition)
Lauren Wisdorf (University of Minnesota, Department of Food Science and Nutrition)

Background Information

The purpose of this study is to determine the foods and beverages people consume during a typical month and examine their reasons for choosing these foods.

Procedures:

You will attend one introductory session (15-30 minutes) where you will be given detailed instructions to participate. For the next 28 days you will record all foods and beverages you consume each day. You will complete a survey (20-25 minutes) each week where you will be asked about the foods you ate during that week.

Risks and Benefits of Being in the Study

The study has several risks. First, annoyance due to the completion of daily food logs. Second, annoyance due to the completion of the final questionnaire (45-60 minutes) is a risk of this study. Benefits include compensation for participating

Compensation:

You will receive payment of up to $50 for participating in all parts of this study. You will receive a cash payment of $5 for your attendance at the introductory session. You will also receive $20 by mailed check following the completion of the 28-day food diary. You will receive an additional $25 by mailed check after submitting the fourth weekly questionnaire.

Confidentiality:

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. Study data will be encrypted according to current University policy for protection of confidentiality.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researchers to contact for this study are: Lauren Wisdorf and Zata Vickers. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact them at wisdo020@umn.edu or zvickers@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be given a copy of this information to keep for your records.

Signature of Investigator: _____ Date: _____

Appendix F: Introductory session reminder slip

Welcome to the Food Diary Study!

Subject #: _____

With any questions, please email **Lauren Wisdorf at wisdo020@umn.edu**.

Today, you will be emailed a questionnaire about your eating habits, behaviors, and food choices. Please complete this survey **before** beginning your food diary. Your personal food diary template will also be shared with you today.

Please begin your food diary on _____.

The last day of your food diary is _____ and you will be paid $20 by mailed check.

Weekly, you will receive a link for a questionnaire about the foods you ate. Please complete this questionnaire as soon as possible. Following the submission of your fourth weekly questionnaire, you will be compensated $25 by mailed check.

Food Diary Entry Instructions:

Your food diary may be opened and edited on your shared Google Drive Sheet on computers or using the mobile device Google Sheets application.

List all foods and beverages consumed every day at each meal occasion including breakfast, lunch, dinner, morning snack, afternoon snack, early evening snack, and late evening snack. Please provide as much detail in naming to make each food meaningfully distinguishable to you. To illustrate, see examples below:

- If you consume pizza on a regular basis and always consume the same brand and type of pizza, you may name this food "pizza." If you go out to a Pizza Lucé and get a type of pizza that is meaningfully distinguishable to you from your usual, you would name it "Pizza Lucé pizza."

- If you always consume coffee with cream, you may name this food "coffee." If you occasionally add sugar to your coffee, making this beverage meaningfully distinguishable to you, it may be named "coffee with sugar."

Thank you for participating!

Appendix G: Qualtrics personality questionnaire

Thank you for participating in the Food Diary Study!

Throughout this 10-minute survey, you will be asked a series of questions broadly referring to your eating habits and behaviors as well as your food choices.

All information you provide in this survey is strictly confidential.

Please enter your email address:

_____

Please indicate to what extent the following are generally true for you:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I am constantly sampling new and different foods	○	○	○	○	○	○	○
I don't trust new foods	○	○	○	○	○	○	○
If I don't know what is in a food, I won't try it.	○	○	○	○	○	○	○
I like foods from different countries.	○	○	○	○	○	○	○
Ethnic foods look too weird to eat.	○	○	○	○	○	○	○
At dinner parties, I will try a new food	○	○	○	○	○	○	○
I am afraid to eat things I have never had before	○	○	○	○	○	○	○
I am very particular about the foods I will eat.	○	○	○	○	○	○	○
I will eat almost anything.	○	○	○	○	○	○	○
I like to try new ethnic restaurants.	○	○	○	○	○	○	○

Please indicate to what extent the following are generally true for you:

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
It is easy for me to concentrate on my activities.	○	○	○	○	○	○	○
Frequently when I am working I find myself worrying about other things.	○	○	○	○	○	○	○
Time always seems to be passing slowly.	○	○	○	○	○	○	○
I often find myself at "loose ends," not knowing what to do.	○	○	○	○	○	○	○
I am often trapped in situations where I have to do meaningless things.	○	○	○	○	○	○	○

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
Having to look at someone's home movies or travel slides bores me tremendously.	○	○	○	○	○	○	○
I have projects in mind all the time, things to do.	○	○	○	○	○	○	○
I find it easy to entertain myself.	○	○	○	○	○	○	○
Many things I have to do are repetitive and monotonous.	○	○	○	○	○	○	○
It takes more stimulation to get me going than most people.	○	○	○	○	○	○	○
I get a kick out of most things I do.	○	○	○	○	○	○	○
I am seldom excited about my work.	○	○	○	○	○	○	○
In any situation I usually can find something to do or see to keep me interested.	○	○	○	○	○	○	○
Much of the time I just sit around doing nothing.	○	○	○	○	○	○	○
I am good at waiting patiently	○	○	○	○	○	○	○
I often find myself with nothing to do – time on my hands.	○	○	○	○	○	○	○
In situations where I have to wait, such as a line, I get very restless.	○	○	○	○	○	○	○
I often wake up with a new idea.	○	○	○	○	○	○	○
It would be very hard for me to find a job that is exciting enough.	○	○	○	○	○	○	○
I would like more challenging things to do in life.	○	○	○	○	○	○	○
I feel that I am working below my abilities most of the time.	○	○	○	○	○	○	○
Many people would say that I am a creative or imaginative person	○	○	○	○	○	○	○

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I have so many interests; I don't have time to do everything.	○	○	○	○	○	○	○
Among my friends, I am the one who keeps doing something the longest.	○	○	○	○	○	○	○
Unless I am doing something exciting, even dangerous, I feel half-dead and dull.	○	○	○	○	○	○	○
It takes a lot of change and variety to keep me really happy.	○	○	○	○	○	○	○
It seems that the same things are on television or the movies all the time; it's getting old.	○	○	○	○	○	○	○
When I was young, I was often in monotonous and tired situations.	○	○	○	○	○	○	○

For each of these items, please indicate your agreement:

	Very strong disagree-ment	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree	Very strong agreement
I seldom change the pictures on my walls.	○	○	○	○	○	○	○	○	○
I am not interested in poetry.	○	○	○	○	○	○	○	○	○
It is unpleasant seeing people in strange weird clothes.	○	○	○	○	○	○	○	○	○
I am continually seeking new ideas and experiences.	○	○	○	○	○	○	○	○	○
I much prefer familiar people and places.	○	○	○	○	○	○	○	○	○
When things get boring I like to find some new and unfamiliar experience.	○	○	○	○	○	○	○	○	○

	Very strong disagree-ment	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree	Very strong agreement
I like to touch and feel a sculpture.	○	○	○	○	○	○	○	○	○
I don't enjoy doing daring foolhardy things just for fun.	○	○	○	○	○	○	○	○	○
I prefer a routine way of life to an unpredictable one full of change.	○	○	○	○	○	○	○	○	○
People view me as quite an unpredictable person.	○	○	○	○	○	○	○	○	○
I like to run through heaps of fallen leaves.	○	○	○	○	○	○	○	○	○
I sometimes like to do things that are a little frightening.	○	○	○	○	○	○	○	○	○
I prefer friends who are reliable and predictable to those who are excitingly unpredictable.	○	○	○	○	○	○	○	○	○
I prefer an unpredictable life full of change to a more routine one.	○	○	○	○	○	○	○	○	○
I wouldn't like to try the new group-therapy techniques involving body sensations.	○	○	○	○	○	○	○	○	○
Sometimes I really stir up excitement.	○	○	○	○	○	○	○	○	○
I never notice textures.	○	○	○	○	○	○	○	○	○
I like surprises.	○	○	○	○	○	○	○	○	○
My ideal home would be peaceful and quiet.	○	○	○	○	○	○	○	○	○
I eat the same kind of food most of the time.	○	○	○	○	○	○	○	○	○

	Very strong disagree-ment	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree	Very strong agreement
As a child, I often imagined leaving home just to explore the world.	○	○	○	○	○	○	○	○	○
I like to experience novelty and change in my daily routine.	○	○	○	○	○	○	○	○	○
Shops with thousands of exotic herbs and fragrances fascinate me.	○	○	○	○	○	○	○	○	○
Designs and patterns should be bold and exciting.	○	○	○	○	○	○	○	○	○
I feel best when I am safe and secure.	○	○	○	○	○	○	○	○	○
I would like the job of a foreign correspondent of a newspaper.	○	○	○	○	○	○	○	○	○
I don't pay much attention to my surroundings.	○	○	○	○	○	○	○	○	○
I don't like the feeling of wind in my hair.	○	○	○	○	○	○	○	○	○
I like to go somewhere different nearly every day.	○	○	○	○	○	○	○	○	○
I seldom change the décor and furniture arrangement at my place.	○	○	○	○	○	○	○	○	○
I am interested in new and varied interpretations of different art forms.	○	○	○	○	○	○	○	○	○
I wouldn't enjoy dangerous sports such as mountain climbing, airplane flying, or sky diving.	○	○	○	○	○	○	○	○	○

	Very strong disagree-ment	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree	Very strong agreement
I don't like to have lots of activity around me.	○	○	○	○	○	○	○	○	○
I am interested only in what I need to know.	○	○	○	○	○	○	○	○	○
I like meeting people who give me new ideas.	○	○	○	○	○	○	○	○	○
I would be content to live in the same house the rest of my life.	○	○	○	○	○	○	○	○	○
I like continually changing activities.	○	○	○	○	○	○	○	○	○
I like a job that offers change, variety, and travel even if it involves some danger.	○	○	○	○	○	○	○	○	○
I avoid busy, noisy places.	○	○	○	○	○	○	○	○	○
I like to look at pictures that are puzzling in some way.	○	○	○	○	○	○	○	○	○

Please click the arrows (>>) below to submit this survey!
Thank you for your participation in the Food Diary Study.
If you have any questions about the study, please contact Lauren Wisdorf at wisdo020@umn.edu.

Appendix H: Qualtrics weekly questionnaire

Please read the following description carefully before continuing with the survey:

In this survey, you will be asked a question about your experience throughout the past week of the Food Diary Study.

You will also be provided with a comprehensive list of your consumed foods and beverages throughout the study. For each listed food, please describe the extent to which your selection was impacted (no, little, moderate, or high impact) by the listed factors.

Please complete this survey within one week of receiving it.

Following the completion of your fourth weekly questionnaire, you will be compensated the final $25.00 by mailed check.

All information you provide in this survey is strictly confidential.

Pleases enter your email address:

_____

To which degree were you satisfied with the variety you consumed throughout the past week of the 28-day Food Diary Study?

- o Completely dissatisfied
- o Mostly dissatisfied
- o Somewhat dissatisfied
- o Neither satisfied nor dissatisfied
- o Somewhat satisfied
- o Mostly satisfied
- o Completely satisfied

Food #1:

	No Impact on Selection	**Little Impact on Selection**	**Moderate Impact on Selection**	**High Impact on Selection**
Liking	○	○	○	○
Convenience/preparation time	○	○	○	○
Habit	○	○	○	○
Time of day	○	○	○	○
Hunger	○	○	○	○
Preferences of others	○	○	○	○
Health or nutrition	○	○	○	○
Low cost	○	○	○	○
Presence on a restaurant/take-out menu	○	○	○	○

Special occasion (e.g. birthday, holiday)	○	○	○	○
Sociability	○	○	○	○
To improve my mood	○	○	○	○
Because it was the only thing served	○	○	○	○

Food #2
…

Please click the arrows (>>) below to submit this survey!

Thank you for your participation in the Food Diary Study.
As a reminder, you will be mailed a final payment of $25 following the submission of your fourth weekly survey.

If you have any questions about the study, please contact Lauren Wisdorf at wisdo020@umn.edu.

Appendix I: R Code

The following was done to install necessary statistical packages:

```
install.packages(“car”)
install.packages("effects")
install.packages("ggplot2")
install.packages("agricolae")
install.packages("gridExtra")
install.packages("plyr")
install.packages("multiway")
install.packages("lme4")
install.packages("alr4")
```

The following was done to require necessary statistical packages:

```
library(car)
library(effects)
library(ggplot2)
library(agricolae)
library(gridExtra)
library(plyr)
library(multiway)
library(lme4)
library(alr4)
```

The following was done to import data to assess dietary variety:

```
variety=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data
Files/variety.csv",header=TRUE)
```

The following was done to prepare data for logistic regression:

```
variety$failures<-variety$total_28-variety$count_28
logit=cbind(variety$count_28, variety$failures)
```

The following was done to import data for the cumulative count of unique foods:

```
cumulative=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/cumulative.csv
",header=TRUE)
cumulative_forplot=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data
Files/cumulative_forplot.csv",header=TRUE)
```

The following was done to evaluate histograms of data:

```
par(mfrow=c(1,1))
hist(variety$total_28, main=NULL,xlab="Total foods consumed in 28 days", ylab="Number of
participants")
summary(variety$total_28)

hist(cumulative$week.1, main=NULL,xlab="Count of unique foods consumed during week 1",
ylab="Number of participants")
summary(cumulative$week.1)

hist(variety$count_28, main=NULL,xlab="Count of unique foods", ylab="Number of participants",
breaks=20)
summary(variety$count_28)
```

```
hist(variety$prop_28, main=NULL,xlab="Proportion of unique foods", ylab="Number of participants",
breaks=10)
summary(variety$prop_28)
```

The following was done to create a line plot of the cumulative count of unique foods:

```
cumulative_plot<- ggplot() +
        geom_line(aes(y=count,x=week,group=subject),
        data=cumulative_forplot, stat="identity")+
        xlab("Week")+
        ylab("Cumulative count of unique foods")+
        theme_bw()+
        theme(panel.border = element_blank())+
        theme(axis.text=element_text(size=12), axis.title.x=element_text(size=14, face="bold"),
axis.title.y=element_text(size=14, face="bold"))
```

The following was done to compare female and male participants in their food consumption:

```
plot(total_28~sex, data=variety)
plot(count_28~sex, data=variety)
plot(prop_28~sex, data=variety)

t.test(variety$total_28[variety$sex=="F"], variety$total_28[variety$sex=="M"])
t.test(variety$total_bfast[variety$sex=="F"], variety$total_bfast[variety$sex=="M"])
t.test(variety$total_lunch[variety$sex=="F"], variety$total_lunch[variety$sex=="M"])
t.test(variety$total_dinner[variety$sex=="F"], variety$total_dinner[variety$sex=="M"])
t.test(variety$total_msnak[variety$sex=="F"], variety$total_msnak[variety$sex=="M"])
t.test(variety$total_afsnak[variety$sex=="F"], variety$total_afsnak[variety$sex=="M"])
t.test(variety$total_eesnak[variety$sex=="F"], variety$total_eesnak[variety$sex=="M"])
t.test(variety$total_lesnak[variety$sex=="F"], variety$total_lesnak[variety$sex=="M"])
t.test(variety$total_tsnak[variety$sex=="F"], variety$total_tsnak[variety$sex=="M"])

t.test(variety$count_28[variety$sex=="F"], variety$count_28[variety$sex=="M"])
t.test(variety$count_bfast[variety$sex=="F"], variety$count_bfast[variety$sex=="M"])
t.test(variety$count_lunch[variety$sex=="F"], variety$count_lunch[variety$sex=="M"])
t.test(variety$count_dinner[variety$sex=="F"], variety$count_dinner[variety$sex=="M"])
t.test(variety$count_msnak[variety$sex=="F"], variety$count_msnak[variety$sex=="M"])
t.test(variety$count_afsnak[variety$sex=="F"], variety$count_afsnak[variety$sex=="M"])
t.test(variety$count_eesnak[variety$sex=="F"], variety$count_eesnak[variety$sex=="M"])
t.test(variety$count_lesnak[variety$sex=="F"], variety$count_lesnak[variety$sex=="M"])
t.test(variety$count_tsnak[variety$sex=="F"], variety$count_tsnak[variety$sex=="M"])

t.test(variety$prop_28[variety$sex=="F"], variety$prop_28[variety$sex=="M"])
t.test(variety$prop_bfast[variety$sex=="F"], variety$prop_bfast[variety$sex=="M"])
t.test(variety$prop_lunch[variety$sex=="F"], variety$prop_lunch[variety$sex=="M"])
t.test(variety$prop_dinner[variety$sex=="F"], variety$prop_dinner[variety$sex=="M"])
t.test(variety$prop_msnak[variety$sex=="F"], variety$prop_msnak[variety$sex=="M"])
t.test(variety$prop_afsnak[variety$sex=="F"], variety$prop_afsnak[variety$sex=="M"])
t.test(variety$prop_eesnak[variety$sex=="F"], variety$prop_eesnak[variety$sex=="M"])
t.test(variety$prop_lesnak[variety$sex=="F"], variety$prop_lesnak[variety$sex=="M"])
t.test(variety$prop_tsnak[variety$sex=="F"], variety$prop_tsnak[variety$sex=="M"])
```

The following was done to observe differences in total number of foods consumed with age:

```
par(mfrow=c(1,3))
```

```
plot(total_28~age, data=variety, xlab="Age (years)", ylab="Total number of foods",cex.lab=1.5,
cex.axis=1.5)
total_age=lm(total_28~age, data=variety)
abline(total_age)
summary(total_age)
```

The following was done to observe differences in count of unique foods consumed with age:

```
plot(count_28~age, xlab="Age (years)", ylab="Count of unique foods", data=variety,cex.lab=1.5,
cex.axis=1.5)
count_age=lm(count_28~age, data=variety)
abline(count_age)
summary(count_age)
```

The following was done to observe differences in proportion of unique foods consumed with age:

```
model.logit=glm(logit~age, data=variety, family=binomial)
summary(model.logit)
```

The following was done to observe differences in the total number of foods consumed by personality trait:

```
par(mfrow=c(1,3))
plot(total_28~neophobia, data=variety, xlab="Food neophobia score", ylab="Total number of
foods",cex.lab=1.5, cex.axis=1.5)
summary(lm(total_28~neophobia, data=variety))
abline(lm(total_28~neophobia, data=variety))
plot(total_28~sensation, data=variety, xlab="Sensation-seeking tendency score", ylab="Total number of
foods",cex.lab=1.5, cex.axis=1.5)
summary(lm(total_28~sensation, data=variety))
abline(lm(total_28~sensation, data=variety))
plot(total_28~boredom, data=variety, xlab="Boredom proneness score", ylab="Total number of
foods",cex.lab=1.5, cex.axis=1.5)
summary(lm(total_28~boredom, data=variety))
abline(lm(total_28~boredom, data=variety))
```

The following was done to observe differences in the count of unique foods consumed by personality trait:

```
par(mfrow=c(1,3))
plot(count_28~neophobia, data=variety, xlab="Food neophobia score", ylab="Count of unique
foods",cex.lab=1.5, cex.axis=1.5)
summary(lm(count_28~neophobia, data=variety))
abline(lm(count_28~neophobia, data=variety))
plot(count_28~sensation, data=variety, xlab="Sensation-seeking tendency score", ylab="Count of unique
foods",cex.lab=1.5, cex.axis=1.5)
summary(lm(count_28~sensation, data=variety))
abline(lm(count_28~sensation, data=variety))
plot(count_28~boredom, data=variety, xlab="Boredom proneness score", ylab="Count of unique
foods",cex.lab=1.5, cex.axis=1.5)
summary(lm(count_28~boredom, data=variety))
abline(lm(count_28~boredom, data=variety))
```

The following was done to observe differences in the proportion of unique foods by personality trait:

```
par(mfrow=c(1,3))
logneo<-glm(logit~neophobia, data=variety, family=binomial)
```

```
summary(logneo)
logsen<-glm(logit~sensation, data=variety, family=binomial)
summary(logsen)
logbore<-glm(logit~boredom, data=variety, family=binomial)
summary(logbore)
```

The following was done to import data to compare the frequencies of impact ratings by choice influencer:

```
CI=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/frequency of impact ratings by choice influencer.csv ",header=TRUE)
```

The following was done to compare the frequencies of impact ratings by choice influencer:

```
CI$influencer<-factor(CI$influencer, levels=c("Only thing served","Mood improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
ggplot(CI, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High impact", "Moderate impact", "Little impact", "No impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=18, face="bold"), legend.text=element_text(size=16), axis.text=element_text(size=16), axis.title.x=element_text(size=18, face="bold"), axis.title.y=element_text(size=18, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for alcohol food class:

```
alcohol=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/alcohol_frequency of impact ratings.csv",header=TRUE)
alcohol$influencer<-factor(alcohol$influencer, levels=c("Only thing served","Mood improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
plot_alcohol<-ggplot(alcohol, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Alcohol")+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High impact", "Moderate impact", "Little impact", "No impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"), legend.text=element_text(size=10), axis.text=element_text(size=10), axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12, face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for beverages food class:

```
beverages=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data
Files/beverages_frequency of impact ratings.csv",header=TRUE)
beverages$influencer<-factor(beverages$influencer, levels=c("Only thing served","Mood
improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of
others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
plot_beverages<-ggplot(beverages, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Beverages")+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
                impact", "Moderate impact", "Little impact", "No impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
                legend.text=element_text(size=10), axis.text=element_text(size=10),
                axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
                face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for candy food class:

```
candy=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/candy_frequency of
impact ratings.csv",header=TRUE)
candy$influencer<-factor(candy$influencer, levels=c("Only thing served","Mood improvement","Special
occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time
of day","Hunger","Convenience","Liking"))
plot_candy<-ggplot(candy, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Candy")+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
                impact", "Moderate impact", "Little impact", "No impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
                legend.text=element_text(size=10), axis.text=element_text(size=10),
                axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
                face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for dairy food class:

```
dairy=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf//Thesis/Thesis Data Files/dairy_frequency of
impact ratings.csv",header=TRUE)
dairy$influencer<-factor(dairy$influencer, levels=c("Only thing served","Mood improvement","Special
occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time
of day","Hunger","Convenience","Liking"))
plot_dairy<-ggplot(dairy, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Dairy")+
```

```
        xlab("Choice influencer")+
        ylab("Frequency of impact rating")+
        scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
        impact", "Moderate impact", "Little impact", "No impact"))+
        theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
        legend.text=element_text(size=10), axis.text=element_text(size=10),
        axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
        face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for desserts food class:

```
desserts=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/desserts_frequency of
impact ratings.csv",header=TRUE)
desserts$influencer<-factor(desserts$influencer, levels=c("Only thing served","Mood
improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of
others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
plot_desserts<-ggplot(desserts, aes(x=influencer, y=Freq, fill=Rating))+
        geom_bar(stat="identity")+
        coord_flip()+
        geom_col(position=position_stack(reverse=TRUE))+
        ggtitle("Desserts")+
        xlab("Choice influencer")+
        ylab("Frequency of impact rating")+
        scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
        impact", "Moderate impact", "Little impact", "No impact"))+
        theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
        legend.text=element_text(size=10), axis.text=element_text(size=10),
        axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
        face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for eggs food class:

```
eggs=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/eggs_frequency of impact
ratings.csv",header=TRUE)
eggs$influencer<-factor(eggs$influencer, levels=c("Only thing served","Mood improvement","Special
occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time
of day","Hunger","Convenience","Liking"))
plot_eggs<-ggplot(eggs, aes(x=influencer, y=Freq, fill=Rating))+
        geom_bar(stat="identity")+
        coord_flip()+
        geom_col(position=position_stack(reverse=TRUE))+
        ggtitle("Eggs")+
        xlab("Choice influencer")+
        ylab("Frequency of impact rating")+
        scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
        impact", "Moderate impact", "Little impact", "No impact"))+
        theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
        legend.text=element_text(size=10), axis.text=element_text(size=10),
        axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
        face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for entrees food class:

```
entrees=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/entrees_frequency of impact ratings.csv",header=TRUE)
entrees$influencer<-factor(entrees$influencer, levels=c("Only thing served","Mood improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
plot_entrees<-ggplot(entrees, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Entrees")+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High impact", "Moderate impact", "Little impact", "No impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"), legend.text=element_text(size=10), axis.text=element_text(size=10), axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12, face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for fats food class:

```
fats=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/fats_frequency of impact ratings.csv",header=TRUE)
fats$influencer<-factor(fats$influencer, levels=c("Only thing served","Mood improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
plot_fats<-ggplot(fats, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Fats")+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High impact", "Moderate impact", "Little impact", "No impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"), legend.text=element_text(size=10), axis.text=element_text(size=10), axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12, face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for fruits food class:

```
fruits=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/fruits_frequency of impact ratings.csv",header=TRUE)
fruits$influencer<-factor(fruits$influencer, levels=c("Only thing served","Mood improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
plot_fruits<-ggplot(fruits, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
```

```
        geom_col(position=position_stack(reverse=TRUE))+
        ggtitle("Fruits")+
        xlab("Choice influencer")+
        ylab("Frequency of impact rating")+
        scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
        impact", "Moderate impact", "Little impact", "No impact"))+
        theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
        legend.text=element_text(size=10), axis.text=element_text(size=10),
        axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
        face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for grains food class:

```
grains=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/grains_frequency of
impact ratings.csv",header=TRUE)
grains$influencer<-factor(grains$influencer, levels=c("Only thing served","Mood improvement","Special
occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time
of day","Hunger","Convenience","Liking"))
plot_grains<-ggplot(grains, aes(x=influencer, y=Freq, fill=Rating))+
        geom_bar(stat="identity")+
        coord_flip()+
        geom_col(position=position_stack(reverse=TRUE))+
        ggtitle("Grains")+
        xlab("Choice influencer")+
        ylab("Frequency of impact rating")+
        scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
        impact", "Moderate impact", "Little impact", "No impact"))+
        theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
        legend.text=element_text(size=10), axis.text=element_text(size=10),
        axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
        face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for meats food class:

```
meats=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/meats_frequency of
impact ratings.csv",header=TRUE)
meats$influencer<-factor(meats$influencer, levels=c("Only thing served","Mood improvement","Special
occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time
of day","Hunger","Convenience","Liking"))
plot_meats<-ggplot(meats, aes(x=influencer, y=Freq, fill=Rating))+
        geom_bar(stat="identity")+
        coord_flip()+
        geom_col(position=position_stack(reverse=TRUE))+
        ggtitle("Meats")+
        xlab("Choice influencer")+
        ylab("Frequency of impact rating")+
        scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
        impact", "Moderate impact", "Little impact", "No impact"))+
        theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
        legend.text=element_text(size=10), axis.text=element_text(size=10),
        axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
        face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for miscellaneous food class:

```
misc=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/misc_frequency of impact ratings.csv",header=TRUE)
misc$influencer<-factor(misc$influencer, levels=c("Only thing served","Mood improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
plot_misc<-ggplot(misc, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Miscellaneous")+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High impact", "Moderate impact", "Little impact", "No impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"), legend.text=element_text(size=10), axis.text=element_text(size=10), axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12, face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for soups food class:

```
soups=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/soups_frequency of impact ratings.csv",header=TRUE)
soups$influencer<-factor(soups$influencer, levels=c("Only thing served","Mood improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
plot_soups<-ggplot(soups, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Soups")+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High impact", "Moderate impact", "Little impact", "No impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"), legend.text=element_text(size=10), axis.text=element_text(size=10), axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12, face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for vegetables food class:

```
vegetables=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/vegetables_frequency of impact ratings.csv",header=TRUE)
vegetables$influencer<-factor(vegetables$influencer, levels=c("Only thing served","Mood improvement","Special occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time of day","Hunger","Convenience","Liking"))
plot_vegetables<-ggplot(vegetables, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
```

```
coord_flip()+
geom_col(position=position_stack(reverse=TRUE))+
ggtitle("Vegetables")+
xlab("Choice influencer")+
ylab("Frequency of impact rating")+
scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
impact", "Moderate impact", "Little impact", "No impact"))+
theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
legend.text=element_text(size=10), axis.text=element_text(size=10),
axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to compare the frequencies of impact ratings by choice influencer for water food class:

```
water=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/water_frequency of
impact ratings.csv",header=TRUE)
water$influencer<-factor(water$influencer, levels=c("Only thing served","Mood improvement","Special
occasion","Sociability","Low cost","Presence on a menu","Preferences of others","Habit","Health","Time
of day","Hunger","Convenience","Liking"))
plot_water<-ggplot(water, aes(x=influencer, y=Freq, fill=Rating))+
        geom_bar(stat="identity")+
        coord_flip()+
        geom_col(position=position_stack(reverse=TRUE))+
        ggtitle("Water")+
        xlab("Choice influencer")+
        ylab("Frequency of impact rating")+
        scale_fill_discrete(name="Impact rating",breaks=c("a","b","c","d"),labels=c("High
        impact", "Moderate impact", "Little impact", "No impact"))+
        theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
        legend.text=element_text(size=10), axis.text=element_text(size=10),
        axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
        face="bold"), plot.title=element_text(size=12, face="bold"))
```

The following was done to prepare figures for results section:

```
grid.arrange(plot_alcohol, plot_beverages, plot_candy, plot_dairy, ncol = 2)
grid.arrange(plot_desserts, plot_eggs, plot_entrees, plot_fats, ncol=2)
grid.arrange(plot_fruits, plot_grains, plot_meats, plot_misc, ncol=2)
grid.arrange(plot_soups, plot_vegetables, plot_water, ncol=2)
```

The following was done to prepare figures for discussion section:

```
disc_alcohol=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/alcohol_health
habit sociability.csv",header=TRUE)
disc_alcohol$influencer<-factor(disc_alcohol$influencer, levels=c("Habit", "Health", "Sociability"))
plot_disc_alcohol<-ggplot(disc_alcohol, aes(x=influencer, y=Freq, fill=Rating))+
        geom_bar(stat="identity")+
        coord_flip()+
        geom_col(position=position_stack(reverse=TRUE))+
        ggtitle("Alcohol")+
        xlab("Choice influencer")+
        ylab("Frequency of impact rating")+
        scale_fill_discrete(name="Impact rating",breaks=c("a","b"),labels=c("High to moderate
        impact", "Little to no impact"))+
```

```
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
                legend.text=element_text(size=10), axis.text=element_text(size=10),
                axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
                face="bold"), plot.title=element_text(hjust=0.5, size=12, face="bold"))

disc_beverages=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data
Files/beverages_health habit sociability.csv",header=TRUE)
disc_beverages$influencer<-factor(disc_beverages$influencer, levels=c("Habit", "Health", "Sociability"))
                plot_disc_beverages<-ggplot(disc_beverages, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Beverages")+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b"),labels=c("High to moderate
                impact", "Little to no impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
                legend.text=element_text(size=10), axis.text=element_text(size=10),
                axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
                face="bold"), plot.title=element_text(hjust=0.5, size=12, face="bold"))

disc_water=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/water_health habit
sociability.csv",header=TRUE)
disc_water$influencer<-factor(disc_water$influencer, levels=c("Habit", "Health", "Sociability"))
plot_disc_water<-ggplot(disc_water, aes(x=influencer, y=Freq, fill=Rating))+
                geom_bar(stat="identity")+
                coord_flip()+
                geom_col(position=position_stack(reverse=TRUE))+
                ggtitle("Water")+
                xlab("Choice influencer")+
                ylab("Frequency of impact rating")+
                scale_fill_discrete(name="Impact rating",breaks=c("a","b"),labels=c("High to moderate
                impact", "Little to no impact"))+
                theme(legend.title.align=0.5, legend.title=element_text(size=12, face="bold"),
                legend.text=element_text(size=10), axis.text=element_text(size=10),
                axis.title.x=element_text(size=12, face="bold"), axis.title.y=element_text(size=12,
                face="bold"), plot.title=element_text(hjust=0.5, size=12, face="bold"))

grid.arrange(plot_disc_alcohol, plot_disc_beverages, plot_disc_water, ncol=1)
```

The following was done to import data for Parafac analysis:

```
mypath<- "G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/"
food <- read.csv(paste0(mypath,"parafac_influencers and food classes.csv"))
```

The following was done to remove necessary participants for Parafac analysis:

```
# remove subject 13 - failed to complete Week 3 Questionnaire
ix <- which(food$subject == 13)
food <- food[-ix,]
# remove subject 33 - responded "3" (moderate impact on selection) for each choice influencer for each
food all weeks
ix <- which(food$subject == 33)
```

```
food <- food[-ix,]
```

The following was done to redefine factor levels for Parafac analysis:

```
food$subject <- factor(food$subject)
summary(food$subject)
```

The following was done to remove supplements food class for Parafac analysis:

```
ix <- which(food$class == "supplements")
food <- food[-ix,]
food$class <- factor(food$class)
summary(food$class)
nlevels(food$class)
names(food)
```

The following was done to create an array for Parafac analysis:

```
# tensor: class (16) by influencer (13) by subject (100)
# subset at subject and food class, calculating means across food items
X <- array(NA, dim = c(16,13,100))
subLev <- levels(food$subject)
infLev <- names(food[,3:15])
claLev <- levels(food$class)
dimnames(X) <- list(claLev, infLev, subLev)
for(i in 1:length(subLev)){
  for(j in 1:length(claLev)){
    ijfood <- subset(food, subject == subLev[i] & class == claLev[j])
    if(nrow(ijfood) > 0L) X[j,,i] <- colMeans(ijfood[,3:15], na.rm = TRUE)
  }
}
```

The following was done to determine the proportion of missing data by food class:

```
mean(is.na(X))
apply(is.na(X), 1, mean)
```

The following was done to remove nondairy food class for Parafac analysis:

```
Xnew <- X[-13,,]
# Taking out categories
Xnew[is.na(Xnew)] <- 1
```

The following was done to center the data:

```
Xc <- ncenter(ncenter(Xnew, mode = 1), mode = 2)
```

The following was done to determine the correct number of factors for Parafac analysis:

```
pflist <- vector("list", 10)
for(k in 1:10){
  cat("# of Factors:",k,"\n")
  set.seed(1)
  pflist[[k]] <- parafac(Xc, nfac = k, nstart = 25, const=c(0,1,0))
}
SSE <- sapply(pflist, function(x) x$SSE)
Rsq <- sapply(pflist, function(x) x$Rsq)
par(mfrow=c(1,1))
plot(1:10, SSE)
```

```
plot(1:10, 1 - Rsq)
```

The following was done to fit the Parafac model with 3 factors:

```
set.seed(1)
pfac <- pflist[[3]]
pfac <- resign(resign(pfac, mode="B"), mode="C", absorb="A")
# plot results
par(mfrow=c(1,3))
plot(pfac$A)
text(pfac$A, claLev[-13])
abline(h=0, lty=3)
abline(v=0, lty=3)
plot(pfac$B, xlim=c(0,2))
text(pfac$B, infLev)
abline(h=0, lty=3)
abline(v=0, lty=3)
plot(pfac$C)
text(pfac$C, subLev)
```

The following was done to load data for analysis of satisfaction:

```
satis=read.csv("G:/FSCN/Vickers_Lab/Lauren Wisdorf/Thesis/Thesis Data Files/weekly variety and satisfaction.csv",header=TRUE)
```

The following was done to remove participants for analysis of satisfaction:

```
satis <- satis[!(satis$subject == 13),]
satis <- satis[!(satis$subject == 33),]
```

The following was done to assess linear regression model of weekly satisfaction ratings and weekly averages of choice influencer ratings:

```
m2<-
lmer(satisfaction~avg_convenience+avg_habit+avg_health+avg_hunger+avg_liking+avg_lowcost+avg_menu+avg_mood+avg_prefothers+avg_served+avg_sociability+avg_spoccasion+avg_time+ (1|subject), data=satis)
summary(m2)
coefs<-data.frame(coef(summary(m2)))
coefs$p.z<-2*(1-pnorm(abs(coefs$t.value)))
coefs
```

The following was done to assess repeated measures regression models of weekly satisfaction ratings and participants' weekly food consumption:

```
mtotal<-lmer(satisfaction~week.total + (1|subject), data=satis)
summary(mtotal)
coefs<-data.frame(coef(summary(mtotal)))
coefs$p.z<-2*(1-pnorm(abs(coefs$t.value)))
coefs
munique<-lmer(satisfaction~week.total_unique + (1|subject), data=satis)
summary(munique)
coefs<-data.frame(coef(summary(munique)))
coefs$p.z<-2*(1-pnorm(abs(coefs$t.value)))
coefs
mprop<-lmer(satisfaction~week.total_prop + (1|subject), data=satis)
summary(mprop)
```

```
coefs<-data.frame(coef(summary(mprop)))
coefs$p.z<-2*(1-pnorm(abs(coefs$t.value)))
coefs
```

The following was done to create scatterplots of satisfaction ratings and participants' weekly food consumption:

```
par(mfrow=c(1,3))
plot(satisfaction~week.total, data=satis, xlab="Weekly total number of foods", ylab="Rating of satisfaction with weekly variety",cex.lab=1.5, cex.axis=1.5)
lines(lowess(satis$satisfaction~satis$week.total), col="red", lwd=3)
plot(satisfaction~week.total_unique, data=satis, xlab="Weekly count of unique foods", ylab="Rating of satisfaction with weekly variety",cex.lab=1.5, cex.axis=1.5)
lines(lowess(satis$satisfaction~satis$week.total_unique), col="red", lwd=3)
plot(satisfaction~week.total_prop, data=satis, xlab="Weekly proportion of unique foods", ylab="Rating of satisfaction with weekly variety",cex.lab=1.5, cex.axis=1.5)
lines(lowess(satis$satisfaction~satis$week.total_prop), col="red", lwd=3)
```

Appendix J: Food class inclusions

Food class*	**Food class inclusions*†**
Alcohol	Beer Cider Hard liquor Mixed drinks Wine
Beverages	Coffee Soft drinks Tea
Candy	Candy – chocolate/non-chocolate Honey Jam/jelly/preserves Sugar Sweets Syrup
Dairy	Milk Cheese Dairy-based meal replacements Flavored milk beverage powder with milk Frozen dairy desserts Infant formula Ready-to-drink flavored milk Yogurt
Desserts	Brownies Cakes Cookies Danishes Doughnuts Pastries Pies Pudding
Eggs	Egg substitutes Eggs
Entrees	Sandwiches Pasta dishes (with or without meat) Pizza
Fats	Butter Cream Margarine Meat-based savory snacks Nuts and seeds

	Nut and seed butters Potato chips Salad dressing Shortening
Fruits	Avocados Fried fruits Fruit juice and citrus juice Fruits and citrus fruits Fruit-based savory snack
Grains	Crackers Grains, flour and dry mixes Loaf-type bread and plain rolls Other breads (quick breads, corn muffins, tortillas) Pasta Popcorn/flavored popcorn Ready-to-eat cereal Snack bars Snack chips
Meats	Beef Cold cuts Cured pork Fresh or smoked fish Fresh pork Fried chicken Fried fish Game Lamb Organ meats Poultry Sausage Shellfish/fried shellfish Veal
Miscellaneous	Condiments Guacamole Salsa Sauces
Non-Dairy	Non-dairy cheese Non-dairy milk Non-dairy yogurt
Soups	Gravies Soups
Supplements	Drugs Multi-vitamins

	Supplements
Vegetables	Dark-green vegetables Deep-yellow vegetables Fried potatoes and vegetables Legumes (cooked dried beans) Other starchy vegetables Other vegetables Tomato Vegetable juice White potatoes
Water	Carbonated water (flavored/unflavored) Water
*Food class and food class inclusions modified from Duong (2017) and Haws et al. (2016) †Food class inclusions not limited to those listed in this table	

Appendix K: Weekly proportions of total cumulative counts of unique foods consumed

Participant	Proportions of total cumulative counts of unique foods consumed weekly			
	Week 1	**Week 2**	**Week 3**	**Week 4**
1	0.48	0.69	0.89	1.0
2	0.45	0.62	0.83	1.0
3	0.40	0.63	0.74	1.0
4	0.42	0.66	0.89	1.0
5	0.43	0.69	0.84	1.0
6	0.27	0.57	0.80	1.0
7	0.48	0.68	0.83	1.0
8	0.42	0.59	0.78	1.0
9	0.46	0.70	0.88	1.0
10	0.45	0.64	0.84	1.0
11	0.31	0.61	0.80	1.0
12	0.51	0.75	0.88	1.0
13	0.57	0.89	0.93	1.0
14	0.42	0.59	0.85	1.0
15	0.49	0.67	0.87	1.0
16	0.48	0.75	0.85	1.0
18	0.43	0.66	0.86	1.0
19	0.37	0.66	0.83	1.0
20	0.35	0.61	0.75	1.0
21	0.36	0.59	0.78	1.0
22	0.38	0.63	0.83	1.0
23	0.41	0.75	0.90	1.0
24	0.42	0.62	0.81	1.0
25	0.31	0.55	0.79	1.0
26	0.34	0.54	0.78	1.0
27	0.41	0.62	0.85	1.0
28	0.40	0.60	0.78	1.0
29	0.24	0.48	0.73	1.0
31	0.43	0.60	0.84	1.0
32	0.42	0.62	0.83	1.0
33	0.42	0.65	0.81	1.0
34	0.31	0.63	0.83	1.0
35	0.38	0.63	0.85	1.0
36	0.43	0.65	0.80	1.0
37	0.45	0.74	0.85	1.0
38	0.56	0.74	0.89	1.0
39	0.60	0.79	0.89	1.0
40	0.37	0.65	0.86	1.0
41	0.57	0.78	0.88	1.0
42	0.49	0.69	0.91	1.0
43	0.28	0.51	0.77	1.0
44	0.51	0.68	0.89	1.0
45	0.34	0.57	0.80	1.0
46	0.40	0.62	0.81	1.0
47	0.43	0.65	0.81	1.0

48	0.37	0.63	0.88	1.0
49	0.40	0.74	0.83	1.0
50	0.34	0.57	0.76	1.0
51	0.37	0.69	0.83	1.0
52	0.37	0.61	0.81	1.0
53	0.41	0.65	0.85	1.0
55	0.37	0.53	0.79	1.0
56	0.44	0.66	0.86	1.0
57	0.35	0.57	0.84	1.0
58	0.65	0.83	0.95	1.0
59	0.42	0.62	0.78	1.0
60	0.33	0.56	0.77	1.0
61	0.41	0.66	0.82	1.0
62	0.51	0.70	0.89	1.0
63	0.43	0.68	0.87	1.0
64	0.51	0.71	0.90	1.0
65	0.40	0.60	0.83	1.0
67	0.56	0.89	1.00	1.0
68	0.47	0.73	0.85	1.0
69	0.38	0.61	0.83	1.0
70	0.43	0.65	0.85	1.0
71	0.38	0.61	0.84	1.0
72	0.35	0.57	0.82	1.0
73	0.47	0.70	0.87	1.0
74	0.46	0.70	0.91	1.0
76	0.38	0.63	0.84	1.0
78	0.42	0.66	0.82	1.0
79	0.42	0.69	0.92	1.0
81	0.39	0.63	0.81	1.0
82	0.33	0.56	0.79	1.0
83	0.28	0.55	0.81	1.0
84	0.33	0.62	0.82	1.0
85	0.31	0.61	0.84	1.0
86	0.39	0.67	0.80	1.0
87	0.42	0.71	0.85	1.0
88	0.64	0.81	0.94	1.0
89	0.33	0.64	0.80	1.0
90	0.49	0.68	0.84	1.0
91	0.39	0.60	0.85	1.0
92	0.38	0.63	0.82	1.0
93	0.49	0.75	0.92	1.0
94	0.33	0.61	0.83	1.0
95	0.52	0.76	0.97	1.0
96	0.39	0.61	0.81	1.0
97	0.48	0.73	0.89	1.0
98	0.35	0.63	0.77	1.0
99	0.36	0.60	0.76	1.0
100	0.48	0.69	0.85	1.0
101	0.26	0.60	0.82	1.0
102	0.48	0.74	0.85	1.0

103	0.26	0.49	0.81	1.0
104	0.51	0.73	0.91	1.0
105	0.40	0.63	0.76	1.0
106	0.29	0.59	0.89	1.0
107	0.60	0.81	1.0	1.0
108	0.57	0.82	0.91	1.0
109	0.27	0.53	0.74	1.0